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NORTHERN MARKETING AND NUTRITION RESEARCH DIVISION

PUBLICATIONS AND PATENTS

January-June 1971

Agricultural Research Service
U.S. DEPARTMENT OF AGRICULTURE

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Northern Marketing and Nutrition Research Division
Agricultural Research Service
United States Department of Agriculture
1815 North University
Peoria, Ill. 61604

REQUEST FOR INFORMATION

The results of the research of the Northern Marketing and Nutrition Research Division are published regularly in the technical literature, and public-service patents are secured to cover patentable inventions and discoveries (see page 63). As a convenient guide to our publications and patents, a list with abstracts is published semiannually. The abstracts describe the current research and indicate the progress achieved. Further information on any of the developments, as well as earlier technical papers, may be obtained by writing us.

In conformance with the policy of the Department of Agriculture, Northern Division publications are available to scientists and other specialists, librarians, representatives of the press, and others interested.

Reference to commercial equipment or proprietary products is made as part of the exact experimental conditions. Naming a company or product does not imply approval or recommendation by the U.S. Department of Agriculture over others not mentioned.

Requests for specific reprints should be by number and addressed to the Northern Division. Those titles marked with an asterisk [*] are not available for distribution.

Most of the publications are in journals that are available in libraries. Photographic copies of most journal articles on research at this Division can be purchased from the National Agricultural Library of the U.S. Department of Agriculture, Beltsville, Maryland 20705.

No publications will be sent regularly in response to foreign requests unless exchange arrangements have been made with the Director of the National Agricultural Library.

Copies of previous lists of publications and patents are available upon request.

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PUBLICATIONS

[Publications marked with an asterisk (*) are not available for distribution. When requesting reprints, please order by number. Use your zip code.]

2844 • New Food Products--Soybeans
R. J. Dimler
Proc. Conf. of Collaborators from Southern Agricultural Experiment Stations, New Orleans, Louisiana, March 16-17, 1970. U.S. Agr. Res. Serv., ARS 72-82, pp. 77-84. December 1970

This brief overview of soybeans as a food crop touches on edible soybean oil and on food uses of soybean protein. A continuing increase in the use of soy proteins for foods is anticipated, particularly in such products as protein concentrate, protein isolate, and simulated meats.

2845 • History, Policy, and Significance of the ARS Culture Collection
C. W. Hesseltine, W. C. Haynes, L. J. Wickerham, and J. J. Ellis
In "Culture Collections of Microorganisms," eds. H. Iizuka and T. Hasegawa, Proc. Int. Conf. on Culture Collections, Tokyo, Japan, October 7-11, 1968, pp. 21-38. Tokyo. 1970

The ARS Culture Collection at the U.S. Department of Agriculture's Northern Regional Research Laboratory, Peoria, Illinois, evolved from the collection of fungi begun by Dr. Charles Thom more than 60 years ago and from the microbial collection of the former USDA Bureau of Chemistry and Soils. In 25 years of operation, the ARS Collection has developed policies regarding receipt, maintenance, preservation, and distribution of cultures, especially patent cultures, as well as those of use in agriculture, industry, and education. The availability of a diversity of cultures and of experts familiar with their systematic relationships, their biochemical behavior, and the requirements for culturing and maintaining them has contributed to many significant accomplishments of the Northern Laboratory.

2846 • Survey of Corn for Aflatoxin, Zearalenone, and Ochratoxin
Odette L. Shotwell, C. W. Hesseltine, Marion L. Goulden, and Elsie E. Vandegraft
Cereal Chem. 47(6): 700-707. November 1970

A total of 283 corn samples from commercial markets, including samples from all grades, from the crop year 1967, were assayed for the presence of aflatoxin, ochratoxin, and zearalenone. Samples were extracted and assayed by the procedure developed by the Food and Drug Administration for multitoxin analysis. The sensitivity limits of the analysis as carried out were 1 to 3 p.p.b. aflatoxin B_1 and G_1, 50 p.p.b. ochratoxin A, and 200 p.p.b. zearalenone. Six of the samples--five in sample grade (SG) and one in grade 3--contained aflatoxin in low levels. One SG corn contained ochratoxin A. Zearalenone was identified in two SG samples, and F-3, an estrogenic factor related to zearalenone, could also be present.

2847 • Instant CSM Food Blends for Worldwide Feeding
R. A. Anderson, V. F. Pfeifer, G. N. Bookwalter, and E. L. Griffin, Jr.
Cereal Sci. Today 16(1): 5-8, 11. January 1971

CSM, a corn-soya-milk food blend designed as a supplement for preschool children, has been well accepted around the world. To make CSM quick-cooking, the corn portion of the blend is partially precooked before mixing with the other ingredients. Regular CSM requires cooking for 1 to 5 minutes in boiling water to make a gruel. In areas where a fuel shortage exists, even this short period of cooking presents a problem. An instant food blend incorporating the CSM formula and offering the same nutritious product could help solve this problem. Earlier studies on how to cook corn meal and grits for regular CSM showed how to prepare completely cooked corn grits suitable for incorporation into an instant CSM. Instant CSM-type gruel and beverage mixes are being developed and evaluated.

2848 • Wheels Make High-Pressure Research Roll
John P. Friedrich
Ann. N.Y. Acad. Sci. 172, Art. 9: 155-174. October 1970

A system is described for high-pressure equipment that can be adapted quickly and conveniently to changing requirements. This versatility is achieved by mobilizing the electronic controls and autoclaves, thereby permitting rapid interchange. All electronic sensing and control equipment is mounted in modules that can be rolled from cell to cell where all power supplies, receptacles, and thermocouple and transducer leads are matched both as to type and location. Autoclaves are mounted on dollies having identical dimensions. The dolly hold-down clamps and utilities and plumbing in each cell are also identical both as to type and location. Resulting mobility allows one to make maximum use of available cells.

2849 · A Search for New Fiber Crops. XIV. Bond Paper Containing Continuously Pulped Kenaf

T. F. Clark, R. L. Cunningham, and I. A. Wolff

Tappi 54(1): 63-65. January 1971

Under pilot-plant conditions, sulfate pulps were produced continuously from green and field-dried kenaf (*Hibiscus cannabinus*), bleached, and then converted to white bond paper. A two-tube Pandia Chemipulper was used with 16.3% active alkali to produce the pulps. The pulps were bleached in a four-stage sequence (CEHD) involving sodium chlorite in the chlorination stage. The bleached pulps were then blended with wood pulps (40:60), and the furnishes run on a pilot fourdrinier machine. Generally, kenaf pulps in the furnishes had favorable effects upon strength of the resulting papers, except for resistance to tear. Surface smoothness of the experimental sheets was better than that of an all-wood control. Elongation and tensile energy absorbed were greater in the kenaf-wood bond. These runs showed a need to: improve mechanics of introducing chopped kenaf into the digester; achieve homogeneous digestion; and increase drainage in kenaf pulps. On the other hand, the smoothness and operating success of this first known production of bond paper containing kenaf pulp demonstrated the adaptability of this pulp to processing in commercial papermaking facilities.

2850* · Fluidization of Flour in a Stirred, Aerated Bed: Part II. Solids Mixing and Circulation

R. A. Brekken,[1] E. B. Lancaster, and T. D. Wheelock[1]
([1]Iowa State University, Ames)

Chem. Eng. Progr. Symp. Ser. 66(105): 277-284. 1970

Solids mixing and circulation in a stirred and aerated fluidized bed of wheat flour were studied by sprinkling a tracer on top of the bed and sampling at frequent intervals for tracer at the bottom of the bed. The mixing times and homogeneity of the resulting mixtures were determined for various conditions of gas velocity, stirrer speed, and bed depth. Mixing performance improved with increases in either gas velocity or stirring speed. The addition of an antiagglomerant also improved performance.

A proposed model, which appeared to simulate the observed circulation pattern of the system, consisted of two perfectly mixed tanks with circulatory interflow--one stream containing transport lag or deadtime. The model was used for estimating the rate of solids circulation. The rate appeared to be a higher-order function of gas velocity and tended to approach the circulation rates of free-flowing solids at very large gas velocities.

2851 · Interspecies Sex-Specific Growth Responses in *Kluyveromyces*
Alberta I. Herman
Antonie van Leeuwenhoek, J. Microbiol. Serol. 36(3): 421-425. 1970

Sex-specific growth factors produced by *a* and α mating types of *Kluyveromyces lactis* were examined for interspecies cross-reactivity on growing cells of *Kluyveromyces aestuarii* and *Kluyveromyces delphensis*. Taxonomically, *K. aestuarii* is closely related to *K. lactis*; *K. delphensis* is more distantly related. Reciprocal growth responses occurred between *K. aestuarii* and the α mating type of *K. lactis*; no response was evident between *K. delphensis* and either sex of *K. lactis*.

2852 · Gas-Liquid Chromatographic Determination of Products from the Progoitrins in Crambe and Rapeseed Meals
M. E. Daxenbichler, G. F. Spencer, R. Kleiman, C. H. VanEtten, and I. A. Wolff
Anal. Biochem. 38(2): 374-382. December 1970

A gas chromatographic procedure was developed for analysis of products from the aglucon moiety of the progoitrins. Conditions were found for the chromatography of prepared mixtures of: 1-cyano-2-hydroxy-3-butene, diastereomers of 1-cyano-2-hydroxy-3,4-epithiobutane, 5-vinyloxazolidine-2-thione, and 3-hydroxypent-4-enethionamide. Quantitation was obtained by relating the experimentally determined response of each compound to that of methyl palmitate added as an internal standard. Equivalent chain length values were determined for assistance in identification of the compounds from unknown sources. Analytical data are reported for the progoitrin content of defatted seed meal of *Brassica napus* and seven species of the *Crambe* genus when assayed by the gas chromatographic procedure.

2853* · Oriental Fermented Foods
H. L. Wang and C. W. Hesseltine
Part 1 (middle section), Seminar on Protein Food Promotion, held at The Institute of Food Research and Product Development, Kasetsart University, Bangkok, Thailand, November 22-December 1, 1970

For centuries the people in Asia have used fermented products made from soybeans and cereals to add pleasure and variety to their vegetable and rice diet. The preparation of these fermented foods, however, is a natural process and household art. Americans and Europeans know little about these products and their involved technology. It was not until the late 1950's that studies on Oriental food fermentation were begun in the

United States at the Northern Regional Research Laboratory and at the New York State Experiment Station, Geneva. Since then we have conducted a modest research program on Oriental food fermentation. We have examined the various processes from a scientific standpoint and applied modern microbiological and biochemical principles to them, to their products, and to the improvement of both. A few of these products with which we have had some experience in the laboratory are miso, hamanatto, sufu, natto, and tempeh. We have also examined fermented foods for their nutritional value and for any mycotoxin contamination.

2854* · The Role of Agriculture in Meeting the Protein Gap
R. J. Dimler
Part 2 (morning session, November 26), Seminar on Protein Food Promotion, held at The Institute of Food Research and Product Development, Kasetsart University, Bangkok, Thailand, November 22-December 1, 1970

Agricultural development in relation to protein foods and nutrition is emphasized. Plants provide some 70% of total food protein, worldwide. The remainder comes almost entirely from animals, including fish. However, the ratio of plant to animal protein in the diet varies widely from country to country. Such differences are the effects of tradition and religion on food selection, the availability or local production of different protein sources, and the income level of the consumer.

Agricultural advances have improved both the amount and the nutritional quality of plant proteins available. On the basis of economics, plants generally are the lower cost source of protein. Nutritionally, animal protein is superior because its proportions of essential amino acids are closer to the ideal. At present, the ideal adopted by FAO-WHO is whole-egg protein of the hen

2855 · Formation of Organic Nitriles from Progoitrins in Leaves of *Crambe abyssinica* and *Brassica napus*
C. H. VanEtten and M. E. Daxenbichler
J. Agr. Food Chem. 19(1): 194-195. January-February 1971

When fresh leaves from crambe and pasture rape were crushed and allowed to autolyze at pH 5.0-5.8, the thioglucosidase-initiated hydrolysis of the progoitrins gave 1-cyano-2-hydroxy-3-butenes and diastereomeric isomers of 1-cyano-2-hydroxy-3,4-epithiobutanes instead of 5-vinyloxazolidine-2-thiones (goitrins). When intact leaves were air-dried, thioglucosidase activity was lost. Addition of white mustard thioglucosidase to an aqueous suspension of ground air-dried leaves at pH 5.0-5.8 or buffered to pH 7.0 gave goitrins instead of the nitriles.

2856 · Survey of the Genus *Penicillium* for Tremorgenic Toxin Production
A. Ciegler and J. I. Pitt
Mycopathol. Mycol. Appl. 42(1-2): 119-124. December 1970

A preliminary survey of the genus *Penicillium* reveals that production of a tremorgenic toxin is confined to certain species of the Subsection Fasciculata, Section Asymmetrica. The most intense toxin synthesis was noted in strains of *P. crustosum*, *P. cyclopium*, *P. granulatum*, and *P. palitans*.

2857 · Powdered Elastomers. Starch Xanthide RF Encased FR-N600 (NBR)
[R. A. Buchanan]
North. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., CA-71-32, 3 pp. January 1971 [Processed]

New powdered elastomers developed at the Northern Division consist of latex particles encased in starch or flour derivatives, which are capable of serving as rubber-reinforcing agents. A wide variety of compositions are possible. Selected powdered elastomer compositions have been prepared on a pilot-plant scale. The data describe an economical powdered NBR elastomer designed as a base for oil-resistant rubbers.

2858 · Powdered Elastomers. Zinc Starch Xanthate RF Encased SBR 1511
[R. A. Buchanan]
North. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., CA-71-33, 3 pp. January 1971 [Processed]

New powdered elastomers developed at the Northern Division consist of latex particles encased in starch or flour derivatives which are capable of serving as rubber-reinforcing agents. A wide variety of compositions are possible. Selected powdered elastomer compositions have been prepared on a pilot-plant scale. The data describe a low-cost, nonstaining SBR powdered elastomer designed for general-purpose utility.

2859 · Powdered Elastomers. Zinc Starch Xanthate Encased SBR 1713
[R. A. Buchanan]
North. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., CA-71-34, 3 pp. January 1971 [Processed]

New powdered elastomers developed at the Northern Division consist of latex particles encased in starch or flour derivatives which are capable of serving as rubber-reinforcing agents. A wide variety of compositions are possible. Selected powdered elastomer compositions have been prepared on a pilot-plant scale. The data describe a low-cost, nonstaining, oil-extended, powdered SBR elastomer designed for general-purpose utility.

2860 • Conjugation of Polyunsaturated Acids
T. L. Mounts, H. J. Dutton, and D. Glover[1]
([1]Bradley University, Peoria, Ill.)
Lipids 5(12): 997-1005. December 1970

The isomerization reaction of methyl linoleate and methyl linolenate with potassium *t*-butoxide has been investigated. The compositions of the reaction products formed at three temperatures have been determined and the relationships between these analyses and observed differences in absorptivities by ultraviolet spectrometry are discussed. Conclusions concerning the reaction mechanisms are based on compositional analysis and results of experiments using radioactive or stable isotope labeled reagent. Double bonds in molecules which are not conjugated during the reaction retain the original *cis* configuration. The double bond in the Δ12 position is the most susceptible to positional isomerization to form the conjugated system. With the diene, this selectivity is small, while with the triene, the shifting of the Δ12 bond is the preponderant initial reaction. Isotopic experiments yielded direct evidence for the postulated carbanion mechanism of reaction. An activated methylene group is generally required for the formation of the carbanion. While the ultraviolet spectra of the reaction products formed from methyl linolenate at 140° C. showed no peak in the diene region, 34% conjugated diene-triene was present. The intact conjugated systems can migrate when the reaction is sufficiently energetic to produce conjugated trienes with double bonds other than the 10, 12, 14 system. The conjugation of triene is a stepwise reaction through the conjugated diene-triene.

2861 • Conjugation of Polyunsaturated Fats: Methyl Linoleate With Tris(triphenylphosphine) Chlororhodium
W. J. DeJarlais and L. E. Gast
J. Amer. Oil Chem. Soc. 48(1): 21-24. January 1971

Tris(triphenylphosphine) chlororhodium in methanol produces nearly 95% conjugated dienes from methyl linoleate. The dienes are principally *cis,trans*- and *cis,cis*-conjugated. Since deuterium is introduced into the products when deuterated methanol is the solvent, a dihydride complex is the probable intermediate. The reaction is sluggish in chloroform, possibly because the dihydride cannot easily form. The catalyst is activated in chloroform with hydrogen. Since no reduction occurs in the absence of hydrogen, hydrogenation likely occurs by hydrogenolysis of the alkyl complex of the dihydride olefin rather than a transfer of both hydrogens from the hydride complex.

2862 · Chlorothioformates of Sugars from the Corresponding Chloromethylsulfenyl Chloride Derivatives

B. S. Shasha and W. M. Doane

Carbohyd. Res. 16(1): 145-152. January 1971

Reaction of bis[3-*O*-(chloromethylsulfenyl chloride)-1,2:5,6-di-*O*-isopropylidene-α-D-glucofuranose] disulfide (2) with sodium iodide gave crystalline 1,2:5,6-di-*O*-isopropylidene-α-D-glucofuranose 3-chlorothioformate (4). With methanol in the presence of pyridine, 2 gave 1,2:5,6-di-*O*-isopropylidene-3-*O*-(methoxythiocarbonyl)-α-D-glucofuranose (5), but in the presence of sodium carbonate 2 gave a mixture of 4, 5, and the corresponding methoxycarbonyl analog of 5. With triethylamine, 3-*O*-diethylthiocarbamoyl-1,2:5,6-di-*O*-isopropylidene-α-D-glucofuranose (6) was obtained. Bis[6-*O*-(chloromethylsulfenyl chloride)-1,2:3,4-di-*O*-isopropylidene-α-D-galactopyranose] disulfide (3), in the presence of Silica Gel G or by titration with alkali, gave bis(1,2:3,4-di-*O*-isopropylidene-α-D-galactopyranose) 6,6'-(tetrathiobis[formate]) (7). With sodium iodide 3 gave either the corresponding chlorothioformate or a mixture of chlorothioformate together with what was assumed to be the iodothioformate.

2863* · Response of Cattle to Mycotoxins of *Fusarium tricinctum* Isolated from Corn and Fescue

N. R. Kosuri,[1] M. D. Grove, S. G. Yates, W. H. Tallent, J. J. Ellis, I. A. Wolff, and R. E. Nichols[1]
([1]University of Wisconsin, Madison)

J. Amer. Vet. Med. Ass. 157(7): 938-940. October 1970

The fungus *Fusarium tricinctum* causes ear or stalk rot of corn and produces a potent mycotoxin, 4β,15-diacetoxy-8α-(3-methylbutyryloxy)12,13-epoxytrichothec-9-en-3α-ol (T-2 toxin) capable of killing animals by inhibiting microsomal oxidative enzymes. This toxin is a potent local irritant and often causes widespread hemorrhages and necrotic foci of the liver and intestines. The same fungus, isolated from tall fescue grass (*Festuca arundinacea*), can produce another toxin, 4-acetamido-4-hydroxy-2-butenoic acid γ-lactone (butenolide), which may play a role in pathogenesis of a disease of cattle referred to as fescue foot. This syndrome usually develops in cold weather in cattle grazing fescue or eating fescue hay. Cattle lose weight, arch their backs, their coats roughen, they become lame in the hind legs, and finally gangrene of the tail and feet develops. The signs have been reproduced by administering extracts of toxic fescue hay.

Sufficient quantities of T-2 and butenolide toxins for use in a trial in cattle were prepared. The LD_{50} of T-2 was 3.8 mg./kg. and the mouse LD_{50} of butenolide was 43.6 mg./kg. This report includes evidence to support the belief that fescue foot might be a mycotoxicosis resulting from consumption of infected tall fescue grass.

2864 · Cultivation and Lyophilization of *Mastigina* sp.
Lynferd J. Wickerham and Frederick C. Page[1]
([1]University of Wisconsin, Rock County Campus, Janesville)
J. Protozool. 17(4): 518-520. November 1970

Mastigina sp. is an amoeboid flagellate isolated from pine frass collected in the Guadarrama Mountains in Spain. It feeds on bacteria and yeasts. It prefers yeasts that produce extracellular polysaccharides, and the two species that have been used predominantly for cultivation of the flagellate are *Pachysolen tannophilus* and *Hansenula holstii*. *Mastigina* sp. is easily isolated in axenic culture and grows abundantly therein. Its locomotive form, averaging 27 μ in length, resembles that of a limax amoeba, with a vesiculate nucleus at the anterior end. Cells are capable of simultaneous movement by pseudopodia and flagella. It develops rapidly on dead or living yeast cells in shaken cultures and the trophozoites may convert quantitatively to cysts. The cysts remain viable for long periods of time in refrigerated suspensions and in the lyophilized state. They are spherical or ovoid and smooth-walled cysts; the trophozoite emerges from them by breaking the wall.

2865* · Absorption of Iodine Vapor by Starch Granules Suspended in Potassium Iodide Solution
R. S. Freeman III,[1] G. T. Tsao,[1] and E. B. Lancaster
([1]Iowa State University, Ames)
Staerke 23(1): 3-7. January 1971

The rate of absorption of iodine vapor by 0.05 *M* KI aqueous solution was measured and also the rate of absorption by starch granules suspended in 0.05 *M* KI solution. The rate was found faster when starch granules were present. Details of the measurement procedures are given.

2866 · Epoxypropyl Starch as a Paper Additive: Preparation and Evaluation
R. E. Wing, W. M. Doane, and C. E. Rist
Tappi 54(2): 222-223. February 1971

Several novel epoxypropyl starches having degrees of substitution from 0.03 to 0.14 were synthesized via a dimethyl sulfoxide-sodium hydride-epichlorohydrin reaction system. The derivatives having degrees of substitution below 0.10 were water soluble and when applied to unbleached kraft wet paper mats significantly improved wet- and dry-tensile strength properties.

2867 • Publications and Patents of the Northern Marketing and Nutrition Research Division, July-December 1970
North. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., Unnumb. Pub., 77 pp. [January 1971]

2868 • Conditions for Production of 3-Ketomaltose from *Agrobacterium tumefaciens*
D. D. Tyler and L. K. Nakamura
Appl. Microbiol. 21(2): 175-180. February 1971

Up to 39% yields of 3-ketomaltose were achieved in 18 to 22 hours when *Agrobacterium tumefaciens* NRRL B-36 was cultured at 25° to 28° C. in a simple medium containing 4.0 to 8.0% maltose, 0.09% urea, 0.5% $CaCO_3$, 0.6% KH_2PO_4, and 0.025% $MgSO_4 \cdot 7H_2O$. For maximum production of 3-ketomaltose the culture had to be maintained approximately at pH 7.0.

2869 • Metabolism of D-Alanine in *Rhodospirillum rubrum* and Its Bacilliform Mutants
J. W. Newton
Nature (London) 228(5276): 1100-1101. December 1970

Studies with the antibiotic cycloserine have indicated that the spiral form of *Rhodospirillum rubrum* has a greater demand for D-alanine than that of its bacilliform mutants. This extra alanine appears to be needed for cell-wall synthesis in the spirilla.

2870 • Glycerides of *Limnanthes douglasii* Seed Oil
Bruce E. Phillips, C. R. Smith, Jr., and W. H. Tallent
Lipids 6(2): 93-99. February 1971

Brockerhoff-type procedures were used to determine the amounts of each acyl group at each glyceride position of *Limnanthes douglasii* seed oil. During the course of the analyses, small quantities of three acids isomeric with those previously found in the oil were identified by their ozonolysis products and their gas-liquid chromatographic (GLC) behavior. The newly discovered constituents of the oil were 3-octadecenoic acid (0.1%), 5-octadecenoic acid (0.9%), and 11-eicosenoic acid (3%). The saturated acids and those with ω-9-unsaturation are esterified most often to β-glyceride positions in *Limnanthes* seed, while the acids with Δ5-unsaturation occur generally at the outer glyceride positions. Although the Δ5-unsaturated acids as a group exhibited no obvious preference for one outer position over the other, individual acids were unequally distributed between the 1- and 3-*sn*-glycerol positions. The probabilities of occurrence of the various triglycerides were calculated from the stereospecific analysis data by assuming a 1-random,2-random,3-random distribution of the acyl groups. The calculations are in agreement with the composition of the whole oil, as determined by GLC.

2871 • Protein-Dialdehyde Starch Glue for Birch Type II Plywood
F. B. Weakley, W. B. Roth, C. L. Mehltretter, and C. E. Rist
Staerke 23(2): 58-62. February 1971

A hot-press, protein-dialdehyde starch glue was used experimentally to prepare plywood from yellow birch veneers. Gluing conditions were similar to those that were previously effective for bonding southern pine veneers to form interior-type plywood test panels. Yellow birch plywood produced under the conditions so developed met the performance requirements for Type II hardwood plywood. The excellent tack that was obtained with cold-pressed panels would allow prepressing in mill operations. Furthermore, yellow birch and southern pine veneers were sufficiently compatible with this moderately alkaline glue to permit mixing these species in the same plywood construction. Bleedthrough of glue was not observed in plywood panels having 1/26-inch birch face veneers. Results indicate that the protein-dialdehyde starch glue should be useful in the manufacture of birch Type II plywood.

2872 • Behavior of Amylose in Ethylenediamine and Formamide
F. R. Dintzis, G. E. Babcock, and R. Tobin
Carbohyd. Res. 17(1): 216-219. March 1971

Solution behavior of dent corn amylose was studied by viscosity, sedimentation, and light-scattering measurements in ethylenediamine and in formamide. In ethylenediamine, amylose behaved as a random coil. Gross asymmetry, which could be caused by negative charges on the amylose backbone, was not observed by our measurements in ethylenediamine. Limited solubility and extensive aggregation of amylose were encountered in formamide.

2873 • Chemical Process for Making Dialdehyde Starch
T. A. McGuire and C. L. Mehltretter
Staerke 23(2): 42-45. February 1971

A practical, strictly chemical process has been developed for the periodic acid oxidation of starch to dialdehyde starch. In the procedure spent oxidant is converted by alkaline hypochlorite to insoluble sodium paraperiodate, which is recovered in high yield for recycling. The process is suitable for small-scale production of dialdehyde starches of various carbonyl contents.

2874 · Soybean Whey Proteins--Recovery and Amino Acid Analysis
J. J. Rackis, D. H. Honig, D. J. Sessa, and J. F. Cavins
J. Food Sci. 36(1): 10-13. January-February 1971

About 14 million pounds of soybean whey protein of high biological value is disposed of as waste based on estimated production figures for soybean concentrates and isolates. An estimated 5 to 7% annual increase in consumption poses serious waste disposal problems and alternates should be sought. By simulated commercial procedures, yield and protein content of soybean whey were determined. Whey solids account for 2 to 28% of original nitrogen in dehulled, defatted flakes. Whole whey protein was prepared by dialysis, and whey was also fractionated by heating into heat-coagulable and supernatant proteins. Whole whey protein has a good balance of essential amino acids when compared with a system followed by the Food and Agricultural Organization of United Nations based on hen's egg protein. Heat-coagulable and supernatant proteins varied greatly: heat-coagulable fractions had 42% of the sulfur amino acid content but 181% of the tryptophan content of hen's egg protein; supernatant protein had 142% of the sulfur amino acid content but only about 60% of the isoleucine, valine, leucine, and tryptophan content of hen's egg protein. All three whey protein fractions would be suitable for addition to feeds.

2875 · Molecular Weight Distribution of the Polyacrylonitrile Moiety of Starch-Polyacrylonitrile Graft Copolymers
L. A. Gugliemelli, M. O. Weaver, C. R. Russell, and C. E. Rist
J. Polym. Sci., Part B, 9(2): 151-155. February 1971

Number-average molecular weights (M_n) and molecular weight dispersities (M_w/M_n) of polyacrylonitrile (PAN) isolated from starch-polyacrylonitrile (S-PAN) graft copolymers having approximately 1 part starch and 1 part PAN were determined in dimethylformamide at 75° C. by gel permeation chromatography (GPC). PAN isolated from S-PAN made from gelatinized starch had correspondingly smaller M_w/M_n and higher M_n values than those isolated from S-PAN made from granular starches. M_w/M_n values of PAN samples isolated from copolymers made from gelatinized starch were 4.25 and 4.69, whereas those isolated from copolymers made from granular starches were 5.95-16.02. However, M_n values of PAN isolated from gelatinized starch were 2,150,000 and 2,580,000; those isolated from copolymers made from granular starches were 181,250-724,000.

Differences between M_n values of PAN samples calculated from the Mark Houwink equation using Onyon's constants and intrinsic viscosity data and values calculated from GPC data were attributed to the broad molecular dispersities of PAN.

2876 · Germination and Outgrowth of *Bacillus thuringiensis* and *Bacillus alvei* Spores Viewed by Scanning Electron and Phase-Contrast Microscopy

Grant St. Julian, Lee A. Bulla, Jr., and Clifford W. Hesseltine

Can. J. Microbiol. 17(3): 373-375. March 1971

Germination and outgrowth of *Bacillus thuringiensis* and *Bacillus alvei* spores were observed by scanning electron (SEM) and phase-contrast microscopy. Germination, seen in phase-contrast as the loss of refractility of the spore, appears in SEM as a partial collapse of the spore. This collapse parallels the long axis of *B. thuringiensis* and is perpendicular to that of *B. alvei*. Outgrowth is initiated when the spore begins to swell. During swelling, the outgrowing spore appears to collapse in SEM and, for *B. thuringiensis*, becomes gnarled. It then begins to elongate and during the elongation time the parasporal body of *B. thuringiensis* loses its refractility and swells. *B. alvei* has no parasporal body. As the cell pushes its way out of the sporangium, the phase-dark parasporal body loses definitive shape; the emerging cell may elaborate an enveloping structure seen only in SEM. This cell then divides into two vegetative cells that also are surrounded by a similar structure. Such an enveloping structure is not seen with *B. alvei*.

2877 · 2-Vinylquinoline, a Reagent to Determine Protein Sulfhydryl Groups Spectrophotometrically

L. H. Krull, D. E. Gibbs, and Mendel Friedman

Anal. Biochem. 40(1): 80-85. March 1971

A reagent has been sought for the selective derivatization of protein sulfhydryl groups that will allow the spectrophotometric determination of the cysteine and cystine content of intact proteins. 2-Vinylquinoline appears to be that reagent. Protein sulfhydryl groups were reacted with 2-vinylquinoline to yield the protein-linked *S*-2-(2-quinolylethyl)-L-cysteine (Qe-cysteine). After the urea solvent and excess reagents were removed, the modified proteins were examined spectrophotometrically. The extinction coefficient (10,000) and absorption maximum (318 mμ) of the protein-linked vinylquinoline derivative were identical to those of the model Qe-cysteine. Optimum conditions for the reaction require an equimolar concentration of 2-vinylquinoline to all sulfhydryls and a 4-hour reaction. The total cysteine and cystine contents of the proteins, when modified under these conditions, were in excellent agreement with standard literature values.

2878 • Full-Fat Soy Flour Extrusion Cooked: Properties and Food Uses

G. N. Bookwalter, G. C. Mustakas, W. F. Kwolek,[1] J. E. McGhee, and W. J. Albrecht
([1]USDA Biometrical Services, Peoria, Ill.)

J. Food Sci. 36(1): 5-9. January-February 1971

Full-fat soy flours prepared by extrusion have good nutritive value, flavor, and stability. A flour cooked to a nitrogen solubility index (NSI) of 30 stored well, but the addition of tertiary butyl hydroquinone was necessary to prevent rancidity in flours cooked to 19 and 11 NSI values. The 30 NSI flour was more yellow than a commercial flour cooked to the same degree by a different process. When soy flours were compared in bread to 3% and 6% nonfat dry milk on an equivalent protein, fat, and reducing sugar basis, baking properties were similar. At 15% and 20% levels of soy flour, loaf volume decreased less with the extruded products than with nonextrusion-processed soy flour.

2879 • Color Stability of Films from Conventional and Emulsion Paints Containing Linseed Oil. Effects of Methyl Azelaaldehydate

George E. McManis, Earl W. Swain, Lyle E. Gast, and John C. Cowan

J. Paint Technol. 43(554): 53-58. March 1971

Color stability and other color characteristics were studied for films of nine different white paint formulations and a commercial acrylic latex after methyl azelaaldehydate (MAZ) was added (from 0% to 10% by weight). The nine paints included both experimental linseed oil-based and linseed oil emulsion paints prepared from two linseed oils (S-37 and M-37), two linseed oil emulsion paints from a commercial linseed oil emulsion, two commercially available linseed oil emulsion paints, and a commercial acrylic latex emulsion paint. MAZ-treated and untreated paints were stored under three different lighting conditions (in a north window, in a fluorescent-lighted room, and in darkness).

The paints were evaluated with a spectroreflectometer for color by the CIE standard observer system. Color stability, whiteness, and yellowness were evaluated by ASTM methods.

The color of the M-37 linseed oil-based paint lightened with time. The white acrylic latex emulsion paint showed no significant effects from the addition of MAZ. Color in linseed oil-based and oil emulsion paints may be improved by adding MAZ, depending upon the concentration of MAZ, paint formulation, bodying of the oil, and storage conditions.

2880 · Improved Preparation of Methyl 4,6-*O*-Benzylidene-α-D-glucopyranoside
J. W. Van Cleve
Carbohyd. Res. 17(2): 461-464. April 1971

Methyl 4,6-*O*-benzylidene-α-D-glucopyranoside, a much-used intermediate in carbohydrate syntheses, has been prepared for the past 42 years by a procedure which, though it gives a good yield, results in an impure product. For many uses this product must be subsequently purified with concomitant delay and loss of yield.

Two rapid methods (one of them a new acetalation procedure) has been developed for preparing methyl 4,6-*O*-benzylidene-α-D-glucopyranoside in analytically pure form in good yield in 1 day.

2881 · Thio Sugars by Isomerization of Carbohydrate Thionocarbonates
D. Trimnell, W. M. Doane, C. R. Russell, and C. E. Rist
Carbohyd. Res. 17(2): 319-326. April 1971

Certain thionocarbonate derivatives of sugars isomerize to the corresponding monothiolcarbonates in the presence of potassium iodide. Structural requirements for isomerization are that the thionocarbonate must include a primary carbon atom of the sugar in a ring and that there be no unprotected hydroxyl groups in the derivative. The 3-*O*-acetyl and the 3-*O*-*p*-tolylsulfonyl derivatives of 1,2-*O*-isopropylidene-α-D-glucofuranose 5,6-thionocarbonate gave the corresponding monothiolcarbonates in excellent yields. In contrast, the parent compound unprotected at C-3 gave no monothiolcarbonate. Methyl 2,3-di-*O*-methyl-α-D-glucopyranoside 4,6-thionocarbonate afforded the 4,6-monothiolcarbonate. With each isomerized product, thiolation occurred at the C-6 position. When treated under similar conditions, two carbohydrate cyclic thionocarbonates involving only secondary carbon atoms, and two acyclic thionocarbonates of fully protected sugars, underwent negligible isomerization.

2882 · Reactions of a Sugar Chlorothioformate
B. S. Shasha, W. M. Doane, C. R. Russell, and C. E. Rist
Carbohyd. Res. 17(2): 444-448. April 1971

Reactions have been investigated of the novel 1,2:5,6-di-*O*-isopropylidene-α-D-glucofuranose 3-chlorothioformate with methanol, pyridine, and trimethylamine. Each time the main product was isolated and identified.

2883 • Mycotoxins of Fungi from Fescue

J. J. Ellis and S. G. Yates

Econ. Bot. 25(1): 1-5. January-March 1971

Different strains of the same species of *Fusarium tricinctum* produce the same toxic metabolites (butenolide and scirpenol). Two different species of *Fusarium (F. tricinctum* and *F. equiseti)* can produce the same butenolide and the same or similar scirpenols. Further, the same strain can produce three different toxic entities on certain media, and their presence or relative amounts can vary with substrate and conditions. Also, certain toxic metabolites of these strains are phytotoxic, as well as toxic, to mammals. Whether or not these toxic materials are associated with fescue foot of cattle is currently being investigated.

2884 • Agronomic Evaluation of Prospective New Crop Species

G. A. White,[1] B. C. Willingham,[2] W. H. Skrdla,[3] J. H. Massey,[4] J. J. Higgins,[5] W. Calhoun,[6] A. M. Davis,[7] D. D. Dolan,[8] and F. R. Earle
([1]USDA Crops Res. Div., Beltsville, Md.; [2]USDA Crops Res. Div., Chico, Calif.; [3]USDA Crops Res. Div., Ames, Iowa; [4]Georgia Agricultural Experiment Station, Experiment, Ga.; [5]USDA Crops Res. Div., Glenn Dale, Md.; [6]Oregon State University, Corvallis; [7]USDA Crops Res. Div., Pullman, Wash.; [8]USDA Crops Res. Div., Geneva, N.Y.)

Econ. Bot. 25(1): 22-43. January-March 1971

Preliminary field evaluations for 162 species are reported. This work represents a portion of a team-oriented effort to develop new crops for American agriculture. These species are potential new oilseed sources of epoxy, crepenynic, erucic, and other fatty acids, and sources of seed gum, steroids, and pulp. *Euphorbia lagascae* and *Cephalaria setosa* show the most promise for crop development as epoxy acid sources, but both require substantial improvement through breeding. *Crepis alpina*, a small-seeded species with excellent seed retention, is the best prospect for providing an oil rich in crepenynic acid. A selection and breeding program is underway. None of the species tested as erucic acid sources equalled the crop potential of crambe and selected Brassicas. *Briza spicata*, a small, moderately productive grass, is the richest known source of glycolipids. *B. spicata* has been grown successfully as a winter annual at several locations. Earlier maturity and better seedling vigor is needed in *Satureja hortensis*, a source of oil similar to linseed oil. *Xeranthemum annuum*, an attractive, winter annual and everlasting, is very good agronomically, but the use of the oil with its mixture of several fatty acids is not economically favorable. *Solanum khasianum* shows agronomic promise as a source of the steroid, solasodine. *Cassia occidentalis, C. bonariensis, Crotalaria leioloba,* and *C. stipularia* are productive potential seed gum sources. These species, especially *Cassia occidentalis*, seem to be sufficiently good agronomically to justify intensive breeding. Of the various sources of pulp, emphasis is on kenaf because high-yielding, well-adapted varieties are available. *Crotalaria juncea* merits breeding effort, and other species show sufficient promise for further evaluation.

2885 · Conjugation of Polyunsaturated Fats: Activity of Some Group VIII Metal Compounds

W. J. DeJarlais and L. E. Gast

J. Amer. Oil Chem. Soc. 48(4): 157-159. April 1971

Conjugation of methyl linoleate was studied by treatment with $RhCl_3$ or *cis*-$Cl_2[(C_6H_5)_3P]_2Pt$-$SnCl_2$. $PdCl_2$ appeared as effective as $RhCl_3$ in hot alcohols in conjugating linolenate but $PdCl_2$ decomposed to metal. Both $RhCl_3$ and the Pt-complex catalyzed transesterification in alcohols, especially the latter. When the conjugation is carried out in methanol at 180° C., the Pt-complex yielded as much as 64% conjugated dienes from linoleate in 24 hours. However, typical results in *n*-butyl carbitol at 150° and 180° C. were only 25-35% conjugated dienes as methyl esters with either $RhCl_3$ or the Pt-complex.

2886 · A Search for New Fiber Crops. XVI. Kenaf Storage

T. F. Clark, R. L. Cunningham, L. A. Lindenfelser, I. A. Wolff,[1] and D. G. Cummins[2]
([1]East. Market. Nutr. Res. Div., Philadelphia, Pa.; [2]University of Georgia Agricultural Experiment Stations, Experiment, Ga.)

In "Non-Wood Fiber Pulping--A Progress Report," CA (Committee Assignment) Report No. 34, Technical Association of the Pulp and Paper Industry, New York, pp. 107-132. 1970

Some techniques for storage and preservation of kenaf that might be necessary for year-round operation of a pulp mill were investigated. Composition and sulfate pulping characteristics of kenaf stalks after either field-drying or harvesting green were studied for storage periods extending more than 1.5 years. Solids content and fiber quality of baled field-dried stalks stored at Experiment, Georgia, were preserved when bales were in a barn or in a rick covered with a tarpaulin. A top bale from an uncovered rick deteriorated considerably more than others. Quality of pulps from anaerobic storage of green kenaf was improved by thorough washing and dewatering before cooking. On the basis of materials only, the estimated cost to produce 100 pounds of unbleached pulp from field-dried material stored in a barn or in a covered rick was less than for field-dried stalks stored in an uncovered rick or stalks harvested green and preserved in silos. Continuous immersion of chopped material might be a competitive approach to storage if a practical method can be developed. However, land usage, processing costs, and available storage facilities are also factors influencing selection of the best way to provide a continuing supply of kenaf for a pulp and paper mill.

2887 • Mycotoxins in *Aspergillus*

G. Semeniuk,[1] G. S. Harshfield,[1] C. W. Carlson,[1]
C. W. Hesseltine, and W. F. Kwolek[2]
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Biometrical Services, Peoria, Ill.)

Mycopathol. Mycol. Appl. 43(2): 137-152. February 1971

The toxigenicity of 392 strains of *Aspergillus*, representing 132 species and 19 varieties, was assessed on chicks and mice fed iso-caloric 50% basal feed mixes of wheat and soybeans molded by these strains. On the basis of death numbers (3 or more of 6 on test), low weight gain of survivors, and low feed consumption over a 4-week period, 166 of the strains representing 73 species and 9 varieties, were toxigenic. Ten species (*A. alliaceus*, *A. avenaceus*, *A. clavato-flavus*, *A. janus*, *A. melleus*, *A. ochraceus*, *A. parasiticus*, *A. quercinus*, *A. sclerotiorum*, and *A. sulphureus*) had strains that were markedly toxic to both animal types on one or both feeds; the other 63 species and 9 varieties had strains that were moderately to mildly toxic to one or both animal types on one or both feeds. In retests of some strains, toxigenicity varied between successive preparation of molded feed.

2888 • Seeds as Sources of L-Dopa

Melvin E. Daxenbichler, Cecil H. VanEtten, E. Ann Hallinan,
Fontaine R. Earle, and Arthur S. Barclay[1]
([1]USDA Crops Research Div., Beltsville, Md.)

J. Med. Chem. 14(5): 463-465. May 1971

L-Dopa [3-(3,4-dihydroxyphenyl)-L-alanine] is now being used effectively in treating Parkinson's disease, manganese poisoning, and dystonia musculorum deformans. Its occurrence in some legume seeds led us to search for other, possibly richer, sources. Its presence in seed extracts was detected by thin-layer chromatography, and when present, its amount was determined by ultraviolet absorption. The procedure was designed to detect and measure the compound if more than 0.5% was present in the seed. Seeds from 724 species representing 447 genera in 135 families were examined. Unexpectedly, in view of previous reports, three accessions of *Vicia faba* and 29 other species of *Vicia* gave negative results and, presumably, contained less than 0.5%. The literature report of L-dopa in *Mucuna* (syn. *Stizolobium*) was confirmed; 10 accessions of this genus ranged from 3.1-6.7%. The extract of *Mucuna holtonii* that indicated 6.7% by ultraviolet absorption gave 6.2% by an ion-exchange amino acid analyzer. The large amounts of L-dopa in seed of *Mucuna* species suggest that members of this genus are good natural sources of this compound.

2889 • Correlation of Biological to Chromatographic Data for Two Mycotoxins Elaborated by *Fusarium*
H. R. Burmeister, J. J. Ellis, and S. G. Yates
Appl. Microbiol. 21(4): 673-675. April 1971

Thirty-seven identified strains of *Fusarium*, most of them isolated from fescue grass, were tested for their ability to elaborate mycotoxins in laboratory culture. The presence of the toxins was determined by infrared light, thin-layer chromatography, mouse toxicity, fungistatic effects, and phytotoxic properties. A good correlation was demonstrated between T-2 toxin detection by thin-layer chromatography and inhibition of *Rhodotorula rubra* by culture extracts. All of the strains producing either butenolide or T-2 toxin were toxic to mice with but one exception; those producing T-2 toxin inhibited growth of the yeast.

2890 • T-2 Toxin Production by *Fusarium tricinctum* on Solid Substrate
H. R. Burmeister
Appl. Microbiol. 21(4): 739-742. April 1971

A method has been developed to produce and purify gram quantities of T-2 toxin [4β,15-diacetoxy-8α-(3-methylbutyryloxy)-12,13-epoxytrichothec-9-en-3α-ol], a mycotoxin elaborated by a strain of *Fusarium tricinctum* isolated from toxic corn. After growing for 3 weeks at 15° C. on 1,200 g. of white corn grits, *F. tricinctum* NRRL 3299 elaborated at least 9.0 g. of T-2 toxin, and 2.3 g. of crystalline product was recovered. A lesser amount of toxin was produced on rice, but none was detected in wheat incubated at 20° C. The amount of toxin measured in white corn grits declined as the incubation temperature was raised to 20, 25, and 32° C.

2891 • Continuous Conversion of Starch to Glucose with Immobilized Glucoamylase
K. L. Smiley
Biotechnol. Bioeng. 13(2): 309-317. March 1971

Partially purified glucoamylase from *Aspergillus awamori* NRRL 3112 was immobilized on diethylaminoethyl cellulose in the presence of low ionic-strength acetate buffers at pH 4.2. The active enzyme-cellulose complex was used to convert starch substrates continuously to glucose in stirred reactors. Substrate concentrations as high as 30% could be quantitatively converted to glucose at a rate of more than 25 mg./min./liter at 55° C. for periods of 3 to 4 weeks in a 4-liter reactor. Shutdowns were due to mechanical problems and not to loss of enzymes, which could be recovered with no appreciable loss of specific activity. Transfer products, such as isomaltose and panose, were present in immobilized enzyme-produced syrups but to no greater degree than in soluble glucoamylase digests of starch.

2892 · Amylose Optical Rotation in Some Mixed Solvent Systems
F. R. Dintzis, R. Tobin, and G. E. Babcock
Biopolymers 10(2): 379-389. February 1971

This paper extends a previous study in which a discontinuity in the specific rotation of open chain α-1,4-linked glucopyranosides in the water-dimethyl sulfoxide (H_2O-DMSO) system was attributed to a symmetry change about a polymer chain segment. Optical rotation of amylose, cyclohexamylose, methyl β-maltoside, and dextran was measured in the following mixed solvent systems: formamide-dimethyl sulfoxide (F-DMSO), ethylenediamine-dimethyl sulfoxide (E-DMSO), and hexamethylphosphoramide-dimethyl sulfoxide (HMPA-DMSO). Refractive index measurements were used in an attempt to detect hydrogen bonding between solvent components. The specific rotation of amylose corrected for variation in refractive index (CSR), as a function of solvent composition, showed a discontinuity at solvent compositions corresponding to about 1 mole F to 2 moles DMSO and to 1 mole E to at least 8 moles DMSO. A discontinuity in the CSR function of amylose in the H_2O-DMSO mixed solvent that occurs at 25° C. is not observed at 70° C. The CSR function of methyl-β-maltoside exhibits a discontinuity in solvent composition corresponding to mole ratios between 2F-DMSO and 3F-DMSO. Present results indicate that an amylose chain segment may undergo a symmetry change in solvent compositions corresponding to mole ratios between F-DMSO and F-2DMSO. Our CSR measurements of amylose and model compounds in E-DMSO and HMPA-DMSO do not permit us to distinguish between possible changes in amylose chain segment symmetry and solvent interactions that could affect symmetry properties of the glucopyranose ring.

2893 · Maintenance of Validity in Physical Tests of Paper
J. O. Ernst, A. J. Ernst, B. T. Hofreiter, W. F. Kwolek,[1] and G. E. Hamerstrand
([1]USDA Biometrical Services, Peoria, Ill.)
Tappi 54(4): 550-552. April 1971

A within-laboratory control procedure has been developed to maintain accuracy and precision of physical test data derived from machine papers. A "standard paper" approach, which also minimizes instrument calibration, serves as a basis of reference for analyses of test data. The control procedure allows (1) periodic checking of instrument accuracy and stability; (2) detecting hidden errors, such as changes in environmental conditions and malfunction of test instruments; (3) detecting differences in precision between similar instruments; and (4) determining operator influence on test results. Data from both standard and experimental papers are computer-processed to summarize test data and statistical evaluations.

2894 · Corn and Sorghum Proteins

G. E. Inglett

Proc. 25th Annual Corn and Sorghum Research Conf., sponsored by American Seed Trade Ass. at Chicago, Illinois, eds. John I. Sutherland and Robert J. Falasca, pp. 67-78. Washington, D.C. December 8-10, 1970

Corn has traditionally been regarded either as an energy source for animal feed or as a carbohydrate source for industrial products. Only in this decade has the corn breeder given his attention to the protein quality and quantity of the corn kernel. The increased interest in corn protein comes from realizing that the nutritive value of corn could be improved by manipulating its genes.

Since the major uses of grain sorghum are for feed and food, the nutritional value of its protein is important. Studies are underway in many parts of the world to find grain sorghum genotypes with improved protein composition. It has been recognized that the protein quality and quantity of grain sorghum as well as of the other cereals--corn, wheat, rice, barley, oats, and millet--are important if improved nutrition is to be gained from these seed crops.

2895 · Aflatoxin Biosynthesis in *Aspergillus parasiticus*: Effect of Methionine Analogs

R. W. Detroy and A. Ciegler

Can. J. Microbiol. 17(5): 569-574. May 1971

The physiological effects of DL-ethionine and related methionine analogs upon cellular protein synthesis and methyl group transfer to aflatoxin B_1 in *Aspergillus parasiticus* were examined in growing and resting cell systems. The addition of DL-ethionine (0.02 *M*) to growing mycelia inhibits cellular growth some 37% after 120 hours of development. Addition of ethionine before 50 hours prevents any aflatoxin synthesis; however, addition of ethionine after aflatoxin production begins has little effect upon continued synthesis. The enzymes responsible for aflatoxin production are made during the transitional phase of growth (50-70 hours). During this period, ethionine administration blocks protein synthesis (measured by ^{14}C-methionine incorporation) 85% and prevents aflatoxin synthesis. Since exogenous ethionine (3.2 m*M*) inhibits aflatoxin B_1 synthesis about 50%, a competitive-type inhibition is indicated. Such inhibition is accompanied by the formation of a new aflatoxin B_1 derivative. The incorporation of ^{14}C-ethylethionine into this derivative indicates a transethylation of the toxin ring system in the formation of ethoxy-aflatoxin B_1. The addition of DL-ethionine and *S*-ethylcysteine to proliferating cells yields some of the aflatoxin B_1 derivative.

2896 • Tremorgenic Toxins from Penicillia. II. A New Tremorgenic Toxin, Tremortin B, from *Penicillium palitans*
C. T. Hou, A. Ciegler, and C. W. Hesseltine
Can. J. Microbiol. 17(5): 599-603. May 1971

A new tremorgenic mycotoxin, tremortin B, was found in the solvent extract of *Penicillium palitans* mycelium. Tremortins A and B were purified by column chromatography on Florisil followed by Sephadex LH_{20}, and recrystallized from several solvents. Tremortin B was determined to be $C_{37}H_{45}NO_5$. The LD_{50} of A is 1.05 mg. and B, 5.84 mg./kg. mouse. A third potential tremorgen, tremortin C, has also been isolated and purified, but so far the yield is insufficient to determine its characteristics.

2897 • An Economic Evaluation of Hominy Feed
Joseph S. Wall, James C. Cavins, Christopher James, and George E. Inglett
Feedstuffs 43(18): 18, 20, 22. May 1971

We have examined the composition and nutritional quality of hominy feed and its ingredients. The high content of essential amino acids in its protein is a nutritional attribute that supplements its energy-providing benefits. Evaluation based on actual analyses in least-cost swine rations indicates that hominy feed is competitively superior to corn at current market prices. The variability in composition of hominy feed results in some economic disadvantages. This variability may be overcome by sales of separate components as premium-priced feed ingredients with optimal guaranteed analysis.

2898 • Free and Immobilized Glucose Isomerase from *Streptomyces phaeochromogenes*
Gerald W. Strandberg and Karl L. Smiley
Appl. Microbiol. 21(4): 588-593. April 1971

Properties were determined of the glucose isomerase from *Streptomyces phaeochromogenes* NRRL B-3559. The enzyme exhibited a temperature optimum of 80° C. and a pH optimum of about 8. The effect of various buffers on activity of the enzyme was studied, as well as the optimum pH. The respective Michaelis constants for glucose and Mg^{++} were 0.25 *M* and 0.025 *M*. Co^{++} enhanced enzyme activity. A functional polyacrylamide-entrapped glucose isomerase was prepared. The conditions for entrapment and use of the bound enzyme were examined.

2899 • Ion-Exchange Chromatography of Soybean Saponins
W. J. Wolf and Betty W. Thomas
J. Chromatogr. 56(2): 281-293. April 1971

Resolution of soybean saponins on Dowex-1 is influenced by resin particle size, flow rate, temperature, and eluting agent. Separations were good when columns of -400 mesh resin were operated at 50° and eluted at slow flow rates with either acetic or propionic acid. A linear gradient of 1.5 to 3 *N* propionic acid separated the saponins into 12 fractions, many of which consisted of two or more components when analyzed by thin-layer chromatography. Glucuronic acid, glucose, galactose, rhamnose, xylose, and arabinose were found in acid hydrolyzates of all fractions, but relative amounts of the neutral sugars varied in most fractions. On analysis of the aglycones, three column fractions contained only soyasapogenol A, one contained only soyasapogenol E, while four consisted of soyasapogenol B plus small amounts of soyasapogenols C and D. Another fraction yielded a previously unreported aglycone, which appears related to soyasapogenol D.

2900 • New Products from Oilseeds
J. J. Spadaro[1] and D. L. Miller
([1]South. Market. Nutr. Res. Div., New Orleans, La.)
Proc. 19th Cottonseed Processing Clinic, held at New Orleans, La., February 16-17, 1970
South. Market. Nutr. Res. Div.
U.S. Agr. Res. Serv., ARS 72-84, pp. 57-61. February 1971

Some of the recently developed products from oilseeds and the processes for their production have been reviewed. Included in the developments outlined are protein-rich foods prepared from whole seeds and from meals, flours and isolates, and edible and industrial products prepared from the oils. The potential use of products in the future from oilseeds is almost limitless.

Primarily because of the protein content, oilseeds are now one of the most important world foods for man and animal. More and more human consumption, with omission of the animal feeding step, can be expected in the future, particularly with the greater and greater need for protein foods to supply the increasing world population.

2901 • A Synthesis of Methyl α-Maltoside
W. E. Dick, Jr., D. Weisleder, and J. E. Hodge
Carbohyd. Res. 18(1): 115-123. May 1971

A mixture of methanol, bromine, and silver carbonate readily converted ethyl 1-thio-β-maltoside into a mixture containing methyl α,β-maltoside and traces of maltose. The α-anomer, which initially formed 85% of the maltoside fraction, was enriched by selective oxidation of the β-anomer with chromic acid. Chromatographic purification gave a 65% yield of methyl α-maltoside of 97% anomeric purity. Nuclear magnetic resonance spectral data for methyl α-maltoside heptaacetate were obtained.

2902 · Extrusion Cooking of Cereals and Soybeans--Part I and Part II
H. F. Conway
Food Prod. Develop. 5(2): 27, 29, 31 (April 1971);
(3): 14, 16, 18, 22 (May 1971)

Extrusion cooking has achieved importance in the past decade as a food processing operation. High-pressure cooking extruders can process grain, oilseeds, or formula mixes for meal, snack foods, and animal feed. Some features of commercial extrusion equipment in current use are described.

Variables that should be considered when using cooking extrusion for production of processed corn and sorghum meals are: moisture content of meal, compression ratio of extruder screw, temperature of extruder, and discharge die configuration. Normal methods used to evaluate corn meal are applicable in determining the effect of variations in extruder operation.

Extrusion cooking can be used in the production of full-fat soy flour, a high-protein food supplement. This process is also used for the production of textured vegetable protein.

2903 · New Process for Low-Cost, High-Protein Beverage Base
G. C. Mustakas, W. J. Albrecht, G. N. Bookwalter,
V. E. Sohns, and E. L. Griffin, Jr.
Food Technol. 25(5): 534-538, 540. May 1971

Adapting soy flours to beverage foods has been difficult because of problems relating to flavor, viscosity, suspension, and mouthfeel. A process has been developed that uses extrusion-cooked full-fat soy flour to make a spray-dried beverage base which reconstitutes with water to a nutritious drink. Properties of the flour indicate its suitability for a wide range of formulations, including vitamin and mineral supplementation and flavoring. The powder made by a special wet-milling and spray-drying process contains 33% protein, 30% fat, and 28% carbohydrate. A typical formulation is based on a blend of extrusion-cooked full-fat soy flour, hydrogenated soybean oil, emulsifier, flavoring, vitamins, and minerals. Extrusion cooking of whole soybeans destroys trypsin inhibitors and other antigrowth factors while retaining good nutritive value. The dry base has good shelf life and reconstitutes to a creamy pale-yellow liquid with good flavor and beverage characteristics. A cost study shows that with soybeans at $2.70 a bushel, the beverage can be produced for less than $0.10 a gallon, to which would be added profits and costs of marketing.

2904* · Thermal Properties of Soft White Winter Wheat Flour
Kuei-jung Li,[1] T. D. Wheelock,[1] and E. B. Lancaster
([1]Iowa State University, Ames)
Chem. Eng. Progr. Symp. Ser. 67(108): 17-23. 1971

The heat capacity and heat of hydration of soft white winter wheat flour were determined calorimetrically for various temperatures and flour moisture contents. It was found that the heat capacity depends upon both temperature and moisture content, and an empirical correlation was obtained to relate the heat capacity to the temperature and moisture content. The heat of hydration was observed to be strongly dependent upon the moisture content but independent of temperature over the range of 25° to 55° C. The measured properties were used for the estimation of enthalpy values, and an enthalpy diagram was prepared.

2905 · Specific Volume and Flow of Corn Grits Under Pressure
E. B. Lancaster
Chem. Eng. Progr. Symp. Ser. 67(108): 30-34. 1971

The pressure-volume relationship of corn endosperm particles was studied under pressures up to 1,590,000 lb./sq. ft. at room temperature. Flow data of corn grits at temperatures from ambient to 350° F. and at 15 and 18% moisture through three different dies were fitted to a power law rheological model containing corrections for entrance and dynamic effects.

2906* · Rates of Water-Vapor Absorption in Granular Cornstarch
Thor P. Hanson,[1] William D. Cramer,[1] William H. Abraham,[1] and Earl B. Lancaster
([1]Iowa State University, Ames)
Chem. Eng. Progr. Symp. Ser. 67(108): 35-39. 1971

A series of integral absorption runs was made with the temperature varying from 30° to 50° C. and the final moisture content from 5 to 20%. Measurements were taken gravimetrically with an electrobalance and a vacuum sorption system. At lower moistures, the process is controlled by intragranular diffusion, whereas at high moistures, the controlling factor is the dissipation of heat due to the heat of absorption. Results are reported in terms of an apparent diffusion coefficient whose behavior shows the effect of particle geometry, heat dissipation effects, and swelling effects on the true diffusion coefficient.

2907 · Isolation of Ethyl α-D-Galactopyranoside and Pinitol from Hexane-Ethanol Extracted Soybean Flakes

David H. Honig, Joseph J. Rackis, and David J. Sessa

J. Agr. Food Chem. 19(3): 543-546. May-June 1971

Ethyl α-D-galactopyranoside and pinitol were isolated during an investigation of the flavor components extracted from dehulled, full-fat, soybean flakes with an azeotropic mixture of hexane:ethanol 81:19. These two compounds were identified by carbon-hydrogen analysis, chromatographic behavior, spectroscopy, optical rotation, and melting point. Full-fat and defatted flakes contain about 0.6 and 0.3% pinitol, respectively. Nearly 0.2% ethyl galactoside was formed in full-fat flakes during extraction with the hexane-ethanol azeotrope; only 0.03% was formed during extraction of defatted flakes. Ethyl α-D-galactopyranoside is bitter, and pinitol is somewhat sweet. Taste-panel tests indicated that the bitter threshold of the galactoside is 0.5% in a water solution, which level indicates that it would not contribute to the bitterness of soy products. L-Tryptophan, also present in soy flakes in its free state at less than threshold levels, is more bitter than the galactoside. The addition of ethyl α-D-galactopyranoside had an additive rather than potentiating effect on the bitterness threshold of either a tryptophan or a soy protein isolate solution.

2908* · Chemiczna Ocena Preparatu Karotenu Otrzymanego Metoda Fermentacji [Chemical Evaluation of Carotene Preparations Produced by Fermentation. In Polish]

Z. Pazola,[1] G. E. N. Nelson, A. Ciegler, and H. H. Hall
([1]Research Laboratory of the Concentrated Food Industry, Poznan, Poland)

Zeszyty Probl. Postepow Nauk Roln. (Collection of Problems on Progress in Agricultural Sciences) 53: 47-52. 1965

2909* · Properties of Sorghum Nutrition and Proteins Related to Utilization

A. C. Beckwith and R. W. Jones

Proc. 6th Grain Sorghum Research and Utilization Conf., Amarillo, Texas, pp. 13-17, March 5-7, 1969

The proteins isolated from various milling fractions of four grain sorghum hybrids were compared on the basis of amino acid composition, solubility, and gel electrophoretic properties. Unique protein compositions, protein solubility properties, and protein amino acid compositions, as well as certain morphological fractions of sorghum grains as related to the major protein fractions, kafarin and glutelin, might help to explain the poor digestibility of sorghum proteins by mammals.

2910* · Extrusion Cooking, A New Development for Soy Protein Foods
G. C. Mustakas
Proc. Central States Section, American Association of Cereal Chemists, 12th Annual Symp. "Extrusion: Process and Product Development," held at St. Louis, Missouri, February 12-13, 1971

Extrusion cooking offers unique features for converting soybeans to food products. Since beans are held at elevated temperatures for only a few minutes, cooking is almost instantaneous. The high-temperature/short-time process destroys growth inhibitors effectively and gives a product that has high nutritive value, mild flavor, and good oxidative stability.

2911* · Ozonolysis
E. H. Pryde and J. C. Cowan
In "Topics in Lipid Chemistry," vol. 2, ed. F. G. Gunstone, pp. 1-98. London. 1971

The literature on ozonolysis is reviewed with emphasis on the developments from 1960 through 1969 and on the applications to fatty acid chemistry. Theoretical, preparative, and analytical aspects are discussed in detail.

2912 · Cooperation Among the Active Binding Sites in the Sex-Specific Agglutinin from the Yeast, *Hansenula wingei*
Neil W. Taylor and William L. Orton
Biochemistry 10(11): 2043-2049. May 1971

Changes in properties of 5-agglutinin were examined during the course of the reaction to inactivate it by cleaving disulfide bonds. During this reaction both agglutinative titer and apparent free energy of absorption decreased rapidly with a relatively small proportion of disulfide bonds reacted. Fractionation experiments disclosed that very little biologically inactive material appeared until about 30% of the disulfide bonds were reacted. The 1.7S component which is released from 5-agglutinin during reaction retains the specific absorptive activity, though only very weakly. It is suggested that the high magnitude of the apparent free energy of association for 5-agglutinin, -14 kcal./mole, is the result of additive effect of several of the individual binding sites, each of which has a binding energy in the range -5 to -9 kcal. per mole. A mathematical model based on these assumptions reproduces the behavior satisfactorily.

2913* · New Methacrylate and Polyacetal Coatings from Linseed Oil
T. H. Khoe, L. E. Gast, and J. C. Cowan
Proc. 40th Annual Flax Inst. of the U.S., Minneapolis, Minn., November 12-13, 1970, pp. 24-26. 1971

Linseed dimethacrylate prepared from linseed oil, diethanolamine, and methacrylic acid can be homopolymerized or copolymerized with linseed oil to yield products that show promise as surface coatings. Hydroformylated linseed oil reacts with polyols or polyols and dibasic acids to yield polyacetals and polyesteracetals, respectively. Both these products and their tolylene diisocyanate-modified derivatives form relatively hard flexible films.

2914* · Linseed Oil for Edible Use: Preliminary Studies
J. C. Cowan
Proc. 40th Annual Flax Inst. of the U.S., Minneapolis, Minn., November 12-13, 1970, pp. 28-30. 1971

Hydrogenation of linseed oil with a copper oxide catalyst and hydrogen reduces the linolenate content of the oil originally from 55 to 60 down to 1.0 to 1.5. When properly deodorized and stabilized in laboratory experiments, this hydrogenated oil has shown good to excellent oxidative and flavor stability. Odor responses in room odor tests indicated that some odors were present which are different from those generally encountered with soybean oil or hydrogenated-winterized soybean oil.

2915 · Selective Hydrogenation with Copper Catalysts: IV. Reaction of Stearolate, Oleate and Conjugated Esters with Deuterium
Sambasivarao Koritala and E. Selke
J. Amer. Oil Chem. Soc. 48(5): 222-227. May 1971

β-Eleostearate and *trans,trans*-conjugated diene were reduced with deuterium in the presence of copper chromite. Considerable exchange of hydrogen atoms of the starting material for deuterium atoms was observed. Conjugated double bond systems isomerized (positional and geometric) extensively during hydrogenation. Isomerization and exchange reactions occurred at a faster rate than hydrogen addition reaction. During early stages of the reaction, a large amount of the product formed contained no deuterium. Of the three possible mechanisms of hydrogen addition to β-eleostearate (1,2; 1,4; and 1,6), no one mechanism could account for all the products formed. Reduction of *trans*-9,*trans*-11-octadecadienoate at a higher temperature and pressure (200° C., 500 p.s.i.) caused a minimum of exchange and isomerization apparently due to sintering of the catalyst. Monoenes were formed from *trans,trans*-conjugated diene by both 1,2 and 1,4 addition. Methyl oleate was not reduced, but extensive isomerization occurred. Deuterium was incorporated into isomeric monoenes. Mechanistic schemes are proposed to account for exchange, isomerization, and hydrogen addition.

2916 · Equivalent Chain Lengths of Methyl Octadecadienoates and Octadecatrienoates

C. R. Scholfield and H. J. Dutton

J. Amer. Oil Chem. Soc. 48(5): 228-231. May 1971

Equivalent chain lengths (ECL) have been determined for a number of methyl octadecadienoates and octadecatrienoates with different stationary phases, including Apiezon L, polyphenyl ether, diethylene glycol succinate, XF 1150, 100% cyanoethyl silicone and tetracyanoethylated pentaerythritol. ECL values for unconjugated esters are slightly larger than calculated by adding the ECL increments over stearate found for octadecenoates with the same position and configuration of double bonds. In general, differences are greater for methylene-interrupted double bonds and for *trans* double bonds. They are greater for more polar columns. Average corrections can be added so that calculated ECL values agree well with the determined values. ECL increases with polarity of the stationary phase. The relative ECL pattern on different stationary phases changes little with position of double bonds in the isomers, but it is affected by double bond configuration. For esters with the same double bond positions isomers with *trans* double bonds tend to have lower ECL values than *cis* on polar stationary phases and higher ECL values on nonpolar. ECL's of conjugated octadecadienoates are always higher than unconjugated and increase in the order *cis,cis;* mono-*trans;* and *trans,trans*.

2917 · Alkyl Azelaaldehydates of High Purity From Alkyl Soyates: Preparation and Properties

R. A. Awl, E. H. Pryde, D. Weisleder, W. K. Rohwedder, and J. C. Cowan

J. Amer. Oil Chem. Soc. 48(5): 233-236. May 1971

Reductive ozonolysis of appropriate alkyl soyates in various participating media produced methyl, ethyl, *n*-propyl, isopropyl, and *n*-butyl azelaaldehydates in good yield and high purity (98+%). The participating media examined were: methyl, ethyl, *n*-propyl, and *n*-butyl alcohols; mixtures of an alcohol and acetic acid; water; and mixtures of water and acetic acid. Any combination of solvent and ester, except methanol-methyl soyate, allowed good separation by fractional distillation of ester and acetal impurities from the azelaaldehydate. A preparative method was developed by which high purity ethyl azelaaldehydate is produced from soybean oil by reductive ozonolysis in water. The only major impurity by this method was ethyl hydrogen azelate, which was easily removed with a bicarbonate wash. After a single fractional distillation with a short Vigreux column, the azelaaldehydate was obtained in 78% yield and 98+% purity. Physical properties and spectral (infrared, nuclear magnetic resonance, and mass spectroscopy) and chromatographic data were determined for the pure alkyl azelaaldehydates. Several of these properties were also determined for acetal and diester byproducts.

2918 • Competitive Hydrogenation Rates of Isomeric Methyl Octadecenoates

C. R. Scholfield, T. L. Mounts, R. O. Butterfield, and H. J. Dutton

J. Amer. Oil Chem. Soc. 48(5): 237-239. May 1971

Hydrogenation rates of isomeric methyl octadecenoates were compared by reducing mixtures containing a small weight of one radioactively labeled isomer and a much larger weight of another unlabeled isomer. As hydrogenation proceeded, samples were removed for analysis by a gas chromatograph, coupled with an ionization chamber so that mass peaks measured reduction of the unlabeled isomer and radioactive peaks of the labeled isomer. The ratio of hydrogenation rates best fitting these data was calculated with a digital computer. Reductions were made at atmospheric pressure generally with either nickel at 140° C. or platinum at 50° C. A few were made with palladium at 50° C. Methyl oleate hydrogenated more rapidly than methyl elaidate and the *cis*-15-isomer more rapidly than oleate. Other variations among the positional *cis* isomers investigated were small.

2919 • Methyl 9(10)-Formylstearate by Selective Hydroformylation of Oleic Oils

E. N. Frankel

J. Amer. Oil Chem. Soc. 48(5): 248-253. May 1971

A highly selective catalyst system has been discovered for the hydroformylation of methyl oleate into methyl 9(10)-formylstearate in high yields. A rhodium catalyst in the presence of triphenylphosphine is used with oleic esters, acids, or triglycerides. Hydroformylation proceeds smoothly at 95-110° C. with a 1:1 mixture of H_2 and CO at 500 to 2,000 p.s.i. with or without a solvent, such as toluene. The formylstearate obtained in 90% to 99% conversion from oleate can be either hydrogenated (Raney Ni) or reduced ($NaBH_4$) to hydroxymethylstearate or oxidized ($KMnO_4$) to carboxystearate. According to thin-layer chromatography and mass spectrometry, the methylated carboxystearate consists of about equal proportions of the 9 and 10 isomers. Addition of triphenylphosphine inhibits isomerization of the double bond and leads to the formation of a rhodium carbonyl triphenylphosphine complex, which is apparently the active catalyst. Other known methods for hydroformylation (cobalt carbonyl) and carboxylation (Koch's method) of oleate give a wide distribution of isomers.

2920 · Food Products from Corn Germ: Evaluation as a Food Supplement After Roll-Cooking

H. W. Gardner, G. E. Inglett, W. L. Deatherage, W. F. Kwolek,[1] and R. A. Anderson
([1]USDA Biometrical Services, Peoria, Ill.)

J. Food Sci. 36(4): 640-644. May-June 1971

The composition of corn germ indicates that it may have value as a nutritious food supplement. Heated rolls were used to cook a full-fat flake to products with varying pasting qualities depending upon the temperature of the rolls and the temper moisture of the germ before rolling. A germ flake with improved taste was produced if the temperature of the rolls was held above 124° C. The flavor of the flakes was unchanged after 120 days' storage at 37° C. and 7% moisture levels. Oil extracted from the flakes stored 120 days had low peroxide values (low, 1.6 meq./kg. oil; high, 17.8 meq./kg. oil). The peroxide values were especially low in oil from uncooked germ and germ cooked at a low temperature (99° C.). When flakes were stored at 13.5% moisture, mold developed on them within 30 days.

2921 · Food Products from Corn Germ: Enzyme Activity and Oil Stability

H. W. Gardner and G. E. Inglett

J. Food Sci. 36(4): 645-648. May-June 1971

Full-fat corn germ was cooked by heated rolls at roll temperatures ranging from 99-204° C. The resulting flakes were examined for peroxidase, lipase, lipoxygenase (formerly lipoxidase) and linoleic acid-hydroperoxide-isomerase activity. Stability of the oil in germ flakes was also investigated. The amount of enzyme activity found in corn germ before roll-cooking was dependent on the post-harvest history of the corn. After picker-sheller harvest, drying the grain in heated air significantly inactivated enzymes. Cooking the germ by heated rolls at temperatures of 124° C. and above completed inactivation of all the enzymes studied except peroxidase. Residual amounts of peroxidase activity remained in almost all samples. The oil in heated germ was resistant to hydrolytic rancidity when stored under nitrogen at a relative humidity as high as 75%. If the germ was stored in air at 75% relative humidity, mold developed on many of the samples. Oxidative rancidity, as measured by the peroxide value of the extracted oil, increased to about 20-40 meq. peroxide/kg. oil after 170 days storage only in the samples heated at or above 124° C. Low peroxide values (1.5-6 meq. peroxide/kg. oil) of oil from relatively unprocessed germ were postulated to result from the action of linoleic acid-hydroperoxide-isomerase. This enzyme catalyzes the conversion of hydroperoxide to products not measured by peroxide value.

2922* · Lipids of the Leguminosae
Ivan A. Wolff and William F. Kwolek[1]
([1]USDA Biometrical Services, Peoria, Ill.)
In "Chemotaxonomy of the Leguminosae," eds. J. B. Harborne, D. Boulter, and B. L. Turner, chap. 6, pp. 231-255. London. 1971

A comprehensive review of the lipid content and composition of legumes reveals chemical diversity that cannot be closely correlated with existent taxonomic classifications based on plant morphology. The limited relationships found pointed to the genus as the most significant hierarchal level in considering the kind of lipid present in particular legumes. The variety of lipids in different plant parts suggests future reexamination of chemotaxonomic relationships after recently evolved laboratory techniques have led to chemical data on a greater number of legumes.

2923 · Kenaf and Other Nonwood Species for Papermaking
T. F. Clark and M. O. Bagby
Indian Pulp and Paper Technical Association, Vol. VII (Conf. No. Suppl.): 16-26. November 1970

Papermaking fibers from timber sources can be successfully supplemented by fibers from nonwood species. At present, available supplies of such fibrous materials as cereal grain straws, sugarcane bagasse, and bamboo are inadequate to meet the increasing demand for more fibers. Fiber screening and developmental research offer prospects of finding annually replenishable plant species that have potential use by the pulping industry. The Malvaceae, Gramineae, and Leguminosae provide the greatest promise as sources of useful fibrous species. Results of research on evaluation of green and field-dried stalks of kenaf, *Hibiscus cannabinus*, on development of storage and processing techniques, and on conversion of pulps to papers, indicate that this species has good opportunity for industrial acceptance in the United States. This species should also have good potential for India.

2924 · Photopolymerization of Methyl Acrylate in Dimethyl Sulfoxide
K. Eskins, F. Dintzis, and M. Friedman
J. Macromol. Sci.-Chem. A5(3): 543-548. May 1971

Methyl acrylate in dimethyl sulfoxide was polymerized by 2537 Å ultraviolet light. The photo reaction exhibited zero-order kinetics for a given initial concentration and produced short chain polymers ($\overline{M}_w \sim 20{,}000$). Low sulfur values of isolated polymers indicated no appreciable solvent incorporation during the polymerization.

2925 • Cyanolipids of Kusum (*Schleichera trijuga*) Seed Oil
K. L. Mikolajczak and C. R. Smith, Jr.
Lipids 6(5): 349-350. May 1971

A cyanolipid, consisting of two fatty acid moieties esterified with 1-cyano-2-hydroxymethylprop-2-ene-1-ol, constitutes 58% of *Schleichera trijuga* (Kusum) seed oil.

2926* • An Integrated Process for Dry-Milling Grain Sorghum
Roy A. Anderson
Proc. 7th Biennial Grain Sorghum Research and Utilization Conf., Lubbock, Texas, pp. 65-69, March 2-4, 1971

A process is described for dry milling grain sorghum into grits, flour, germ, and feed fractions. The process is based on conventional equipment, and is applicable to different types of grain sorghum. It includes abrasive dehulling, degermination by impacting, aspiration and screening, and gravity separation of grits from the germ. Yields of +14 and +20 grits are 71-75%, and fat content of the grits varies from 0.5 to 0.8%.

2927 • Microbiological Spoilage of Mayonnaise and Salad Dressings
C. P. Kurtzman, Ruth Rogers, and C. W. Hesseltine
Appl. Microbiol. 21(5): 870-874. May 1971

Saccharomyces bailii was isolated from two-thirds of the spoiled mayonnaise and salad dressing samples examined. Most of the rest were spoiled by *Lactobacillus fructivorans*. However, one sample contained large numbers of both *S. bailii* and *L. plantarum*. Two of the spoiled samples also contained small numbers of bacilli. *Bacillus subtilis, B. pumilis, B. polymyxa, B. megaterium,* and *B. licheniformis* were found in one sample and *B. subtilis* and *B. pumilis* in another. Small numbers of *B. subtilis* and *B. licheniformis* were also present in one unspoiled sample. Several media were evaluated for the isolation of *L. fructivorans*. *S. bailii* and *L. fructivorans* vigorously fermented glucose. The concentration of glucose in the spoiled samples ranged from 0 to 38.5 g./kg. and from 1.3 to 17.8 g./kg. for the unspoiled samples.

2928* · Processing Sorghum Grain to Improve Nutritional Quality and Industrial Uses
Charles W. Blessin
Proc. 7th Biennial Grain Sorghum Research and Utilization Conf., Lubbock, Texas, pp. 70-73, March 2-4, 1971

Two laboratory processes to improve nutritional quality of sorghum grain have been investigated: alkali dehulling and amino acid infusion. A 20% solution of sodium hydroxide at 160° F. essentially removed the pericarp in four to eight minutes and left the aleurone layer, endosperm, and germ intact. Ash, ether extracts, and protein levels were not significantly affected by alkali dehulling. Fiber contents of the dehulled products were approximately 50% of the level of the whole grain. Amino acid balance in sorghum grain was improved significantly by infusion of aqueous solutions of lysine, methionine, and tryptophan. Levels of lysine ranged from 0.25% (content of the noninfused sorghum grain) to 4.5% in the infused product when different infusion conditions were used. Solubility characteristics of lysine, methionine, and tryptophan influenced maximum levels of amino acids in the infused product.

2929* · Carbohydrate and Protein Interactions in Cereal Processing and Products
G. E. Inglett
Proc. Joint Symp. on Carbohydrate/Protein Interactions, Carbohydrate/Oilseeds Division, American Association of Cereal Chemists, Excelsior Springs, Missouri, June 22-23, 1970

Carbohydrates, mainly starch, and proteins are the major components of the cereals. The interaction and association of these substances that affect cereal processing and products cover a broad frontier of science and technology. The reciprocal action or influence between starch and proteins in corn will be used to illustrate some of these interactions. Particular attention will be placed on the relationships that can be observed microscopically.

2930 · Xanthan Biopolymer Production at Increased Concentration by pH Control
R. A. Moraine and P. Rogovin
Biotechnol. Bioeng. 13(3): 381-391. May 1971

Efficient production of xanthan gum by fermentation with *Xanthomonas campestris* NRRL B-1459 can be accomplished at concentrations of xanthan in the fermented broth >3%. This level of more than twice that previously attained by us results from continuously controlling the fermentation pH with alkali. Only a slight decrease in fermentation rate and yield occurs. When ammonia is used for pH control, cell production more than doubles and fermentation time is shortened. However, xanthan yield is decreased by the diversion of additional sugar to growth.

2931 · Optical Rotatory Dispersion, Circular Dichroism, and Infrared Studies of Wheat Gluten Proteins in Various Solvents

J. E. Cluskey and Y. V. Wu

Cereal Chem. 48(3): 203-211. May-June 1971

The influence of various solvents upon the conformation of gluten proteins, glutenin and gliadin, has been studied by optical rotatory dispersion (ORD), circular dichroism (CD), and infrared (IR) absorption measurements. From ORD data an α-helix content of 38% has been calculated for gliadin in trifluoroethanol; 35% for glutenin. Conversely, little or no α-helix was found when the proteins were dispersed in 8 *M* urea solutions. CD measurements made on gliadin and glutenin showed the presence of α-helical structure. IR absorption spectra of gliadin indicated the presence of α-helical and unordered conformations.

2932 · Effect of Phytate on Isoelectric Focusing of Soybean Whey Proteins

L. C. Wang

Cereal Chem. 48(3): 229-238. May-June 1971

Changes in isoelectric points of soybean whey proteins as a result of phytate elimination or addition were studied by isoelectric focusing between pH 3 and 6. Major whey proteins concentrated at pH 4.2, 4.6, and 5.5. Adjusting the pH of whey solution to pH 8.0 precipitated phytate and decreased a protein peak focused at pH 4.6 in the whey. Anion-exchange resin treatment of whey also removed phytate and lowered the protein peak focused at pH 4.2, as well as other peaks at lower pH values. When sodium phytate was added to proteins from which phytate had been eliminated by the resin method, protein peaks again focused in low pH regions. Proteins focused in the pH 4 region changed more on addition of phytate than those in pH 5 region. Protein mobilities in polyacrylamide-gel electrophoresis also were changed by added phytate. Phytate undoubtedly influenced the net charges of proteins.

2933 · Isoelectric Point Differences in Commercial Soybean Trypsin Inhibitors

L. C. Wang

Cereal Chem. 48(3): 303-312. May-June 1971

Isoelectric points of Kunitz' crystalline soybean trypsin inhibitor (STI), Bowman-Birk STI, and STI prepared by chromatography on diethylaminoethyl (DEAE)-cellulose were investigated by isoelectric focusing, gel filtration, ion-exchange resin treatment, solubility test, and titration. Results

suggest that the STI of Kunitz may have an isoelectric point below pH 4.5. The isoelectric focusing pattern of the Kunitz inhibitor showed three peaks: at pH 3.5, 3.7, and 4.4. All three proteins were active inhibitors. Chromatography on anion-exchange resins separated the Kunitz STI into two fractions: one that eluted with water and focused at pH 3.5 and another that eluted with increasing concentrations of NaCl solution and focused at pH 4.0. When ion-retardation resins were used only one peak resulted, focusing at pH 3.8. Solubility tests on the Kunitz preparation before and after treatment with anion-exchange resins supported evidence for different isoelectric points. Titration of Kunitz' STI at three levels of ionic strength gave an isoionic zone lower than pH 4.5. The Kunitz inhibitor contained about 20% impurities based on gel filtration and the purified protein focused at a single isoelectric pH of 4.0. The Bowman-Birk inhibitor consistently showed an isoelectric point of pH 4.2 in focusing and solubility tests, and it had little or no impurities on gel filtration. Although STI prepared by chromatography on DEAE-cellulose contained impurities, heterogeneity of isoelectric point (pH 4.0) was less than for Kunitz' STI. The multiple isoelectric points of crystalline STI were believed caused by interaction between protein and other constituents, possibly contaminants.

2934 · Tryptophan in Soybean Meal and Soybean Whey Proteins
D. J. Sessa, K. J. Abbey, and J. J. Rackis
Cereal Chem. 48(3): 321-327. May-June 1971

Pronase hydrolyzates of soybean meal, whole-whey protein, and heat-coagulated and supernatant proteins prepared from whey heated at 75° C. for 30 minutes were analyzed for tryptophan by two different colorimetric methods. Dilutions of the hydrolyzates were reacted with either *p*-dimethylaminobenzaldehyde or acetic acid containing ferric ions. In the second method, a reference standard was developed, based on isolated protein, that effectively blanked out high absorbance arising from reaction of concentrated sulfuric acid with soybean constituents. Values in g. tryptophan per 16 g. *N* were: 1.583 and 1.597 for soybean meal, 1.707 and 1.440 for whole whey, 2.433 and 2.380 for heat-coagulated protein, and 1.173 and 1.063 for supernatant protein. Standard deviation was 0.046 g. tryptophan per 16 g. *N* and least significant difference (95% level) between methods was 0.080. Tryptophan values for the whole-whey and supernatant proteins are significantly different by both methods. Calculations based on values of amino acid analysis of these soybean samples and the mean of the tryptophan values obtained by the two colorimetric methods show that soybean meal, whole-whey, heat-coagulated proteins, and supernatant protein contain 120, 113, 153, and 90% of the tryptophan content of the hen's egg essential amino acid pattern (mg. per g. total EAA).

2935* · Structure of Sorghum Prolamin from OK 612, RS 626, TE 77, and Funk G 766 Hybrids

Y. V. Wu, J. E. Cluskey, and R. W. Jones

Sorghum Newsletter 14: 36. 1971

Sorghum prolamin accounts for about 40% of the total protein from sorghum. The structure of prolamin was studied by optical rotation, infrared, and circular dichroism measurements in order to gain some information on the digestibility, gelling properties, and extremely poor solubility of the prolamins. The data indicated that the prolamins in 60% tertiary butanol have 43% helical structure and 57% unordered structure. The helical structure of the prolamin is lowered to 37% in 60% tertiary butanol plus 1.5 *M* guanidine hydrochloride but is reduced to 5% in 6 *M* guanidine hydrochloride. The gelling process and the pigment do not have any influence on the helical structure of prolamin.

2936* · Amino Acid Infusion of Grain Sorghum

J. F. Cavins, C. W. Blessin, and G. E. Inglett

Sorghum Newsletter 14: 36. 1971

Amino acid balance in grain sorghum was improved significantly by infusion with aqueous solutions of lysine, methionine, and tryptophan. Infusion was affected by time, temperature, concentration, amino acid, and sorghum variety. Infusion proceeded in two stages--concentration dependent and concentration independent. A wide range of amino acid levels in the grain could be obtained by using various combinations of time, temperature, and concentration. Solubility characteristics of lysine, methionine, and tryptophan influenced maximum levels of amino acids in the infused product.

2937* · Effect of Alkali Dehulling on Composition and Wet-Milling Characteristics of Sorghum Grain

C. W. Blessin, R. A. Anderson, W. L. Deatherage, and G. E. Inglett

Sorghum Newsletter 14: 36-37. 1971

Three sorghum grains (RS 626, TE 77, and a commercial sample of U.S. No. 2 yellow) were selected to determine the effectiveness of aqueous solutions of sodium hydroxide as dehulling agents. Various times (2, 4, 6, and 8 minutes), temperatures (140°, 160°, and 180° F.), and concentrations (15, 20, and 25% w/w) were investigated. A 20% solution of sodium hydroxide at 160° F. essentially removed the pericarp in 4 to 8 minutes and left the endosperm, aleurone layer, and germ intact. Average yield of dehulled sorghum grain was 92%. Ash, ether extract, and protein levels were not significantly affected by alkali dehulling. Fiber contents of the dehulled products were approximately 50% of the level of the whole grain. When dehulled grain was wet-milled, there was a loss of 5 to 8 percentage points in starch recovery. However, protein content of the starch was about the same as in starch recovered from whole grain. Color of starch from dehulled grain appeared whiter. More and cleaner germ with higher oil content was recovered from dehulled grain. From an overall processing standpoint, 6 minutes was an optimum dehulling time with 20% sodium hydroxide at 160° F.

2938* · Dry-Milling Process for Grain Sorghum
R. A. Anderson
Sorghum Newsletter 14: 37-38. 1971

An integrated process, using conventional equipment, is proposed for dry-milling grain sorghum into grits, flour, germ, and feed. The process includes abrasive dehulling, degermination by impaction, aspiration and screening, and gravity separation of grit from the germ.

2939* · Production of Pathogens in Artificial Media
H. T. Dulmage[1] and R. A. Rhodes
([1]USDA Entomology Research Div., Brownsville, Texas)
In "Microbial Control of Insects and Mites," eds. H. D. Burges and N. W. Hussey, chap. 24, pp. 507-540. London. 1971

Production of insect pathogens and insecticidal products of microbes can be expected to require specific fermentation conditions. These conditions act through the control mechanisms of cells to regulate yields and to provide products with desired characteristics. In addition, the genetic apparatus of cells may be artificially modified by mutation or recombination to develop strains with improved properties. In any event, the physiological and genetic basis for the complex interrelationships that characterize specific host-parasite relationships must be retained while the pathogen is grown in an artificial environment.

The problems inherent in developing a process for *in vitro* production of an insect pathogen are exemplified in current work on the production of *Bacillus popilliae* spores for control of the Japanese beetle. Large quantities of vegetative cells of this bacterium can be grown, but spores are not formed except in diseased larvae or in limited numbers under highly specific laboratory conditions. Infective spores are required for control use. The difficulties and achievements in developing a process for spore production *in vitro* are described with attention to the possibilities for greater success and the implications for production of other insect pathogens.

Two approaches are under investigation: Selection of strains sporogenic *in vitro*, and discovery of the physiological basis for sporulation. Strains that sporulate under special conditions have been isolated. Study of the biochemical processes in these and asporogenic strains should indicate why sporulation does not occur with greater efficiency; at the same time, the infectious process in larvae has been determined. The results of this research may provide an effective process for large-scale spore production and thereby the means for biological control of the Japanese beetle.

2940 · Microapparatus for Studying Flow Birefringence
Jay E. Pittsley, Lloyd R. Bair, James H. Sloneker, and Allene Jeanes
Rev. Sci. Instrum. 42(6): 895-896. June 1971

A Couette-type cell for studying flow birefringence is described. The stainless steel cell consists of a rotor and stator having 4.83-mm. (inside) and 4.57-mm. (outside) diameters, respectively, and a fully visible 0.0127-mm. annulus. Interchangeable cells 3- and 6-mm. long provide a variable light path. Sample volumes of less than 0.05 ml. are required. Accuracy is moderate at velocity gradients from 0.10 sec^{-1} at 0.05 r.p.m. to 20,000 sec^{-1} at 10,000 r.p.m. The cell is mounted on the rotatable stage of a polarizing microscope and the optical system of the microscope is utilized.

A variety of macromolecular microbial polysaccharides and other hydrocolloids have been characterized by measurement of extinction angle and magnitude of birefringence.

2941 · Determination of 3-Deoxy-D-*erythro*-hexosulose (3-Deoxy-D-glucosone) and Other Degradation Products of Sugars by Borohydride Reduction and Gas-Liquid Chromatography
Ahmed A. El-Dash and John E. Hodge
Carbohyd. Res. 18(2): 259-267. June 1971

Quantitative analysis of 3-deoxy-D-*erythro*-hexosulose among other degradation products of sugars, by gas-liquid chromatography (GLC) of its per-trimethylsilyl (TMS) ethers, was not feasible because the multiplicity of tautomeric forms gave numerous peaks. However, borohydride reduction of the complex aldosulose gave only the two expected 3-deoxyhexitols, and these were readily separated from other reduced degradation products of sugars by GLC of their TMS ethers. Relative retention times (T_R) of TMS ethers of alditols and saccharinolactones (C_2-C_6) likely to arise through alkaline degradation and browning reactions of sugars were determined on two columns to provide a method for analyzing complex mixtures of labile degradation products from sugars. Plots of T_R vs. molecular weight of the TMS ethers were regular for alditols and ω-deoxyalditols as one group, but internal-deoxyalditols (alditols having a methylene group within the chain) formed a separate group having consistently large T_R values for the same molecular weight. Sugars vs. deoxy sugars and lactones vs. deoxy lactones showed corresponding relationships.

2942 • Sugars with a New Functional Group: Hydroxythio(thiocarbonate)
B. S. Shasha, W. M. Doane, and C. R. Russell
Carbohyd. Res. 18(2): 251-257. June 1971

The preparation and some properties are described of two sugar derivatives containing a new functional group, namely hydroxythio(thiocarbonate) [ROC(=S)-SOH]. These derivatives were prepared by reaction of hydrogen peroxide with the *O*-(sodium thiolthiocarbonyl) derivative of 1,2:3,4-di-*O*-isopropylidene-α-D-galactopyranose and 1,2:5,6-di-*O*-isopropylidene-α-D-glucofuranose. These derivatives are acidic enough to be titrated with alkali and, in presence of hydrogen peroxide, are able to initiate graft polymerization of acrylamide. The nature of the linkage between the sugars and polyacrylamide is (in part) a thioester type.

2943 • *Vernonia anthelmintica*: A Potential Seed Oil Source of Epoxy Acid. IV. Effects of Line, Harvest Date, and Seed Storage on Quantity and Quality of Oil
G. A. White[1] and F. R. Earle
([1]USDA Crops Research Div., Beltsville, Md.)
Agron. J. 63: 441-443. May-June 1971

Pre- and post-frost harvested seeds of *Vernonia anthelmintica* (L.) Willd. lines PI 283729, VS63-40, and VS65-224 (pre-frost only) were stored under continuous cold, room, and barn (ambient) conditions and sampled at 0, 48, and 96 weeks to determine the effects of storage on oil quantity and quality.

Harvest date did not affect oil content. For the pre-frost harvest, oil content declined with storage time, especially under room and barn conditions, but the gradual reduction was not of practical significance. The oil percentages for seeds of PI 283729 (26.6%) and VS63-40 (29.9%) significantly exceeded that of VS65-224 (22.0%). Seed oils of the three lines did not differ in amounts of epoxy acid or free fatty acids. Epoxy acid content declined during the period from 0 to 48 weeks and then rose from 48 to 96 weeks. Time in storage affected epoxy acid content more than storage conditions. The level of free fatty acids remained essentially unchanged during the storage period. Good quality vernonia seeds can be stored for relatively long periods without a serious reduction in oil content or quality.

Poor quality oils with significantly lower levels of epoxy acid and higher levels of free fatty acids were obtained from the post-frost harvest. The oil from PI 283729 seeds was of poorer quality than that from VS63-40 seeds; the quality of both declined in storage at ambient temperatures.

2944 • Induction of Yeastlike Development in *Aspergillus parasiticus*
R. W. Detroy and A. Ciegler
J. Gen. Microbiol. 65(Pt. 3): 259-264. March 1971

Vegetative development of *Aspergillus parasiticus* may follow either one of two patterns of morphogenesis (hyphal-yeastlike dimorphism) depending upon the presence or absence of manganese ion in the culture medium. The addition of exogenous amino acids, vitamins, and other trace metals had no significant effect upon morphogenetic development or aflatoxin B_1 synthesis. The yeastlike forms are capable of continuous aflatoxin B_1 synthesis under nonproliferating conditions. Varying the Mn^{++} concentration from 7.3×10^{-4} to 7.3×10^{-3} m*M* causes a morphological change from yeastlike to hyphal development in a synthetic medium. The yeastlike forms are stable and resist osmotic shock.

2945 • Kinetic Patterns of Glucoamylase Isozymes Isolated from *Aspergillus* Species
K. L. Smiley, D. E. Hensley, M. J. Smiley, and H. J. Gasdorf
Arch. Biochem. Biophys. 144(2): 694-699. June 1971

The existence of multiple forms of glucoamylase has been known for some time. However, little information is available to differentiate these isozymes other than their electrophoretic mobility. It has now been found that the two forms of glucoamylase from several different *Aspergillus* strains do differ in their rate of attack on starch and glycogen. The Michaelis constant of the least charged isozyme on glycogen approaches infinity, whereas on starch it is several times greater than the more charged form. On small oligosaccharides and maltose the two forms show the same K_m and V_{max} values. In addition to kinetic differences, the two isozyme forms differ in their molecular weight.

REPUBLICATION

2848 • High-Pressure R&D on Wheels
John P. Friedrich
Chem. Technol. 1(1): 52-55. January 1971

This article originally was published under the title "Wheels Make High-Pressure Research Roll" in the Annals of the New York Academy of Sciences, Vol. 172, Article 9, pp. 155-174, October 1970.

UNOFFICIAL PUBLICATIONS

Listing of publications and patents of the Northern Marketing and Nutrition Research Division would not be complete without including some unofficial publications. These are writings by members of the Northern Division staff, and, although written from previously published official material, are of a public service value from the standpoint of review and updating of the literature.

Pseudomonadaceae
William C. Haynes
In "McGraw-Hill Encyclopedia of Science and Technology," 3d ed., vol. 11, ed. William H. Crouse, pp. 66-68. New York. 1971

Pseudomonadales
William C. Haynes
In "McGraw-Hill Encyclopedia of Science and Technology," 3d ed., vol. 11, ed. William H. Crouse, pp. 68-69. New York. 1971

Pseudomonadineae
William C. Haynes
In "McGraw-Hill Encyclopedia of Science and Technology," 3d ed., vol. 11, ed. William H. Crouse, pp. 69-70. New York. 1971

Soybeans as a Food Source
W. J. Wolf and J. C. Cowan
Crit. Rev. Food Technol. 2(1): 81-158. April 1971

CONTRACT AND GRANT RESEARCH PUBLICATIONS

[Report of research work done by an outside agency under contract with the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

234-C • Starch-Elastomer Masterbatches. Preparation, Properties, and Process Design
Howard L. Stephens, Robert W. Roberts, Thomas F. Reed, and Richard J. Murphy
Institute of Polymer Science, University of Akron, Akron, Ohio
Ind. Eng. Chem. Prod. Res. Develop. 10(1): 84-92. March 1971

[Report of research done by an outside agency under a grant from the U.S. Department of Agriculture and supervised by the Northern Marketing and Nutrition Research Division.]

82-G* • The Rheological Properties of Corn Horny Endosperm
J. R. Hammerle,[1] R. K. White,[2] and N. N. Mohsenin[3]
([1]North Carolina State University, Raleigh; [2]Ohio State University, Columbus; [3]Pennsylvania State University, University Park)
Cereal Sci. Today 16(2): 60-64, 66-68, 72. February 1971

84-G* • Measurement of Dynamic Viscoelastic Properties of Corn Horny Endosperm
P. R. Wen and N. N. Mohsenin
Pennsylvania State University, University Park
J. Materials 5(4): 856-867. December 1970

85-G* • Tensile Relaxation Modulus of Corn Horny Endosperm as a Function of Time, Temperature and Moisture Content
J. R. Hammerle and N. N. Mohsenin
Pennsylvania State University, University Park
Trans. ASAE 13(3): 372-375. May-June 1970

87-G* · Methanolysis of Amylose Triesters and Related Compounds
Gustav Entlicher and J. N. BeMiller
Southern Illinois University, Carbondale
Carbohyd. Res. 16(2): 363-374. February 1971

88-G* · Anomeric Methyl 4-*O*-Alkyl-D-glucopyranosides
J. N. BeMiller, Carol L. Collins, Elaine R. Doyle, and R. E. Wing
Southern Illinois University, Carbondale
Carbohyd. Res. 16(2): 480-485. February 1971

89-G* · The Reaction of 4-Nitrocatechol Cyclic Sulfate with α-Chymotrypsin
G. Tomalin, M. Trifunac, and E. T. Kaiser
University of Chicago, Chicago, Ill.
J. Amer. Chem. Soc. 91(3): 722-726. January 1969

90-G · Photolysis of Secondary Azides of Sugars
D. M. Clode and D. Horton
Ohio State University, Columbus
Carbohyd. Res. 14(3): 405-408. September 1970

91-G* · Properties of the Amylase from *Halobacterium halobium*
Wendy A. Good and Paul A. Hartman
Iowa State University, Ames
J. Bacteriol. 104(1): 601-603. October 1970

92-G* · The Action Pattern of Porcine Pancreatic α-Amylase in Relationship to the Substrate Binding Site of the Enzyme
John F. Robyt and Dexter French
Iowa State University, Ames
J. Biol. Chem. 245(15): 3917-3927. August 1970

93-G* · Enzymatic and Nonenzymatic Reactions of Cyclic Sulfonate and Sulfate Esters
Emil Thomas Kaiser
University of Chicago, Chicago, Ill.
Accounts Chem. Res. 3: 145-151. May 1970

95-G* · Extracellular Transglucosylase and α-Amylase of *Streptococcus equinus*
Ernest W. Boyer and Paul A. Hartman
Iowa State University, Ames
J. Bacteriol. 106(2): 561-570. May 1971

[Report of research work supported with funds provided by the U.S. Department of Agriculture under the authority of U.S. Public Law 480, 83rd Congress, and sponsored by the Northern Marketing and Nutrition Research Division.]

322-F · Infrared Absorption Spectra of Aldobiouronic Acids Obtained from Natural Plant Gums and Mucilages
K. S. Bajpai, V. Chandrasekharan, S. Mukherjee, and A. N. Shrivastava
National Sugar Institute, Kanpur, India
Carbohyd. Res. 14(2): 259-262. August 1970

323-F · Studies on Flavor Components in Soybean. Part VI. Some Evidence for Occurrence of Protein-Flavor Binding
Soichi Arai, Masatoshi Noguchi, Michiko Yamashita, Hiromichi Kato, and Masao Fujimaki
University of Tokyo, Tokyo, Japan
Agr. Biol. Chem. 34(10): 1569-1573. October 1970

324-F · Isolation of Actinomycetes from Different Soil Types of Uttar Pradesh and Their Antagonistic Properties
A. K. Agrawal, S. Mehrotra, H. Mondal, P. D. Trivedi, S. Sultana, A. J. Arif, B. J. Jaffri, B. Chandra, and O. P. Srivastava
Central Drug Research Institute, Lucknow, India
Indian J. Microbiol. 8(4): 225-232. October-December 1968

325-F • A New Strain of *Streptosporangium roseum* Couch
S. Mehrotra and O. P. Srivastava
Central Drug Research Institute, Lucknow, India
J. Indian Bot. Soc. 48(3-4): 261-263. 1969

326-F • Distribution of Hydroxyethyl Groups in Commercial Hydroxyethyl Starch. Part II
H. C. Srivastava, K. V. Ramalingam, and N. M. Doshi
Ahmedabad Textile Industry's Research Association, Ahmedabad, India
Staerke 21(7): 181-183. July 1969

327-F • Different Locations of Carbohydrate-Containing Sites in the Surface Membrane of Normal and Transformed Mammalian Cells
Ben-Ami Sela, Halina Lis, Nathan Sharon, and Leo Sachs
Weizmann Institute of Science, Rehovoth, Israel
J. Membrane Biol. 3(3): 267-279. 1970

328-F • Applying Proteolytic Enzymes on Soybean. 2. Effect of Aspergillopeptidase A Preparation on Removal of Flavor from Soybean Products
Masatoshi Noguchi, Soichi Arai, Hiromichi Kato, and Masao Fujimaki
University of Tokyo, Tokyo, Japan
J. Food Sci. 35(3): 211-214. May-June 1970

329-F • Applying Proteolytic Enzymes on Soybean. 3. Diffusable Bitter Peptides and Free Amino Acids in Peptic Hydrolyzate of Soybean Protein
Masao Fujimaki, Michiko Yamashita, Yukio Okazawa, and Soichi Arai
University of Tokyo, Tokyo, Japan
J. Fooc Sci. 35(3): 215-218. May-June 1970

330-F • Synthesis of Campesteryl Acetate ((24*R*)-24-Methyl-3β-acetoxycholesten-5-ene) and Its 24*S*-Epimer
R. Ikan, A. Markus, and E. D. Bergmann
Hebrew University, Jerusalem, Israel
Steroids 16(5): 517-522. November 1970

331-F • Gas Chromatography of Tetra- and Pentacyclic Triterpenes
R. Ikan and R. Gottlieb
Hebrew University, Jerusalem, Israel
Isr. J. Chem. 8(4): 685-689. 1970

332-F • A New Synthesis of 7-Dehydrosterols
R. Ikan, A. Markus, and E. D. Bergmann
Hebrew University, Jerusalem, Israel
Isr. J. Chem. 8(5): 819-822. 1970

333-F • Applying Proteolytic Enzymes on Soybean. 6. Deodorization Effect of Aspergillopeptidase A and Debittering Effect of *Aspergillus* Acid Carboxypeptidase
Soichi Arai, Masatoshi Noguchi, Shukuko Kurosawa, Hiromichi Kato, and Masao Fujimaki
University of Tokyo, Tokyo, Japan
J. Food Sci. 35(4): 392-395. July-August 1970

334-F • Lipids in Cruciferae VI: The Fatty Acid Composition of Seeds of Some Cultivated *Brassica* Species and of *Sinapis alba* L.
L.-A. Appelqvist
Swedish Seed Association, Svalof, Sweden
Fette, Seifen, Anstrichm. 72(9): 783-792. September 1970

January-June 1971

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PATENTS

[These patents are assigned to the Secretary of Agriculture. Copies of patents may be purchased (50 cents each) from the Commissioner of Patents, U.S. Patent Office, Washington, D.C. 20231. Order by number, do not send stamps.]

High-Amylose Starch Acetate

Arthur M. Mark and Charles L. Mehltretter
U.S. Patent 3,553,196. January 5, 1971

Water-soluble food packaging films are cast from aqueous dispersions prepared by steam jet cooking high-amylose corn starch acetates of D.S. 0.21 to 0.31 at 177° C. to disintegrate the granules present. The acetates were produced in granule form by acetylating high-amylose corn starch of 70% apparent amylose content with acetic anhydride in a mixer at 90° to 95° C. for 30 minutes using 1.5% sodium hydroxide (based on dry starch) as catalyst.

Process for the Chlorohydrination of Allyltrimethylammonium Chloride

Thomas A. McGuire and Charles L. Mehltretter
U.S. Patent 3,558,501. January 26, 1971

Allyltrimethylammonium chloride reacted with hypochlorous acid in aqueous solution at 25° to 32° C. forms a mixture of monochlorohydroxypropyltrimethylammonium chlorides in nearly quantitative yield with essentially no formation of dichloropropyltrimethylammonium chloride. The product is of value for reaction with starch and cellulose to produce industrial cationic polysaccharides.

Rapid Microbiological Production of Alpha-Galactosidase

Sin'itiro Kawamura, Tadasi Kasai, and Sumizo Tanusi
U.S. Patent 3,562,113. February 9, 1971

Purified extracts of sonicated 4 to 8 hour cultures of *Escherichia coli*, subsp. *communior*, ATCC 7009, provide very high yields of α-galactosidase that hydrolyzes raffinose and other α-galactosides.

Nitrogen Source for Improved Productions of Microbial Polysaccharides

Martin C. Cadmus, Marvin O. Bagby, Kermit A. Burton, and Ivan A. Wolff
U.S. Patent 3,565,763. February 23, 1971

The use in fermentations of *Arthrobacter viscosus* NRRL B-1973 and other microbes such as *Xanthomonas campestris* that produce high viscosity polysaccharide gum thickeners, in an aqueous fermentation media containing glucose, inorganic salts, and, as the sole nitrogen source, the waste raw juice expressed from the long fibrous shafts of the subtropical plant, *Hibiscus cannabinus* (also known as ambary hemp), which provides culture liquors containing about twice as much polysaccharide and having far higher viscosities than those of prior art fermentations wherein the conventional nitrogen sources for the fermentation are respectively enzyme-hydrolyzed casein and distillers solubles.

Extruder-Cooked Cereal Endosperm Particles and Instant Beverage Mixes Comprising the Same

George N. Bookwalter, Howard F. Conway, and Edward L. Griffin, Jr.
U.S. Patent 3,579,352. May 18, 1971

Cereal grain endosperms having a moisture content of 10 to 20% are heated at 325° to 400° F. in a screw-type extruder at a pressure of 2,000-4,000 p.s.i. The ejected material is milled to provide a cold water soluble product which is combined with soybean flour, nonfat dry milk solids, sugar, salt, minerals, and vitamins to form an instant beverage mix.

Enzymatic Improvement of Soybean Flavor and Stability

Masao Fujimaki, Hiromichi Kato, Soichi Arai, and Michiko Yamashita
U.S. Patent 3,585,047. June 15, 1971

Incubation of soybean curd or defatted soybean flour with certain highly specific proteolytic enzymes liberates extraction-resistant beany and astringent flavor constituents and reversion-sensitive lipid materials from their apparent extremely close association with the proteinaceous constituents. The removal of the enzymatically liberated objectionable taste and oxidation susceptible constituents by washing with aqueous ethanol then provides stabilized soybean materials having little if any astringent and beany flavor and a distinctly diminished tendency to flavor reversion.

Novel Process of Producing L(+)-Tartaric Acid

Koichi Yamada, Yasuji Minoda, Tohru Kodama, and Uichiro Kotera
U.S. Patent 3,585,109. June 15, 1971

L(+)-Tartaric acid is produced in higher yield by the use of *Gluconobacter suboxydans* on a medium containing more than 0.1 milligram per liter of pantothenic acid.

Dual Thickness TLC Plates and Device Therefor

Norman E. Delfel
U.S. Patent 3,585,129. June 15, 1971

Improved thin-layer chromatography (TLC) resolutions are obtained on plates on which the thickness of the continuous adsorbent layer is abruptly increased by a factor of about four or five to provide a narrow, deeply coated zone that increases the uptake of solvent. A spreader for readily preparing the dual thickness plates also is described.

Production of L-Asparaginase

Robert E. Peterson and Alex Ciegler
U.S. Patent 3,589,982. June 29, 1971

L-Asparaginase is produced in high yield by culturing certain fungi, namely, *Erwinia aroideae* or *Hydrogenomonas eutropha*.

LICENSING OF PATENTS

Many inventions and discoveries of the Northern Division are covered by patents assigned to the Secretary of Agriculture.

Assigned patents are available for use by business and industry under either exclusive or non-exclusive licenses. Conditions applicable to the granting of licenses are set forth in the Federal Register, May 14, 1970 [35(94): 7493-7495]. Further information can be obtained from the Administrator, Agricultural Research Service, U.S.Department of Agriculture, Washington, D.C. 20250.

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